SITE SELECTION PROCESS.

PHASE 4A: SELECTION OF A PREFERRED SITE(S)

- Agriculture

Ecologistics Limited

and

Deloitte, Haskins and
Sells Associates

September 24, 1985

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September 24, 1985

Dr. B.D. Mitchell
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Attention: Mr. J.G. Micak
Manager, Environmental Projects

Dear Sir:

Re: Site Selection Process. Phase 4A: Selection of a Preferred Site(s) - Agriculture

We are pleased to forward herewith our final report for the above-noted study. Maps accompanying this report are contained in Site Selection Process. Phase 4A: Selection of a Preferred Site(s) - Agriculture. Technical Data Map Portfolio.

This report documents our analysis of agricultural factors during Phase 4A and our inputs to the work of the site selection team.

We are pleased to have had this opportunity to be of service.

Sincerely yours,

ECOLOGISTICS LIMITED

DR Cressman

D.R. Cressman, M.Sc., P.Ag.
President

DRC/lw
encls.

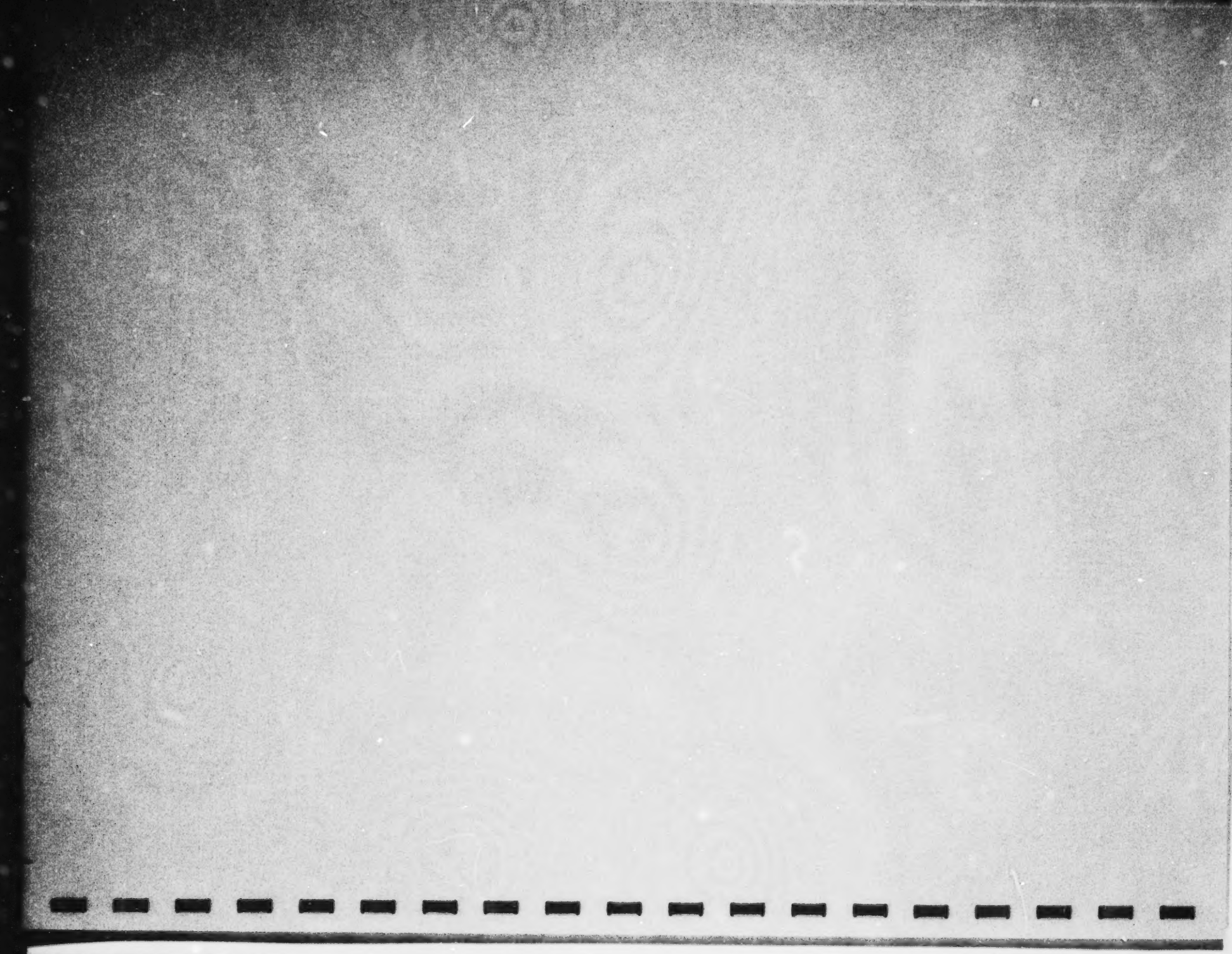


TABLE OF CONTENTS

Letter of Transmittal

EXECUTIVE SUMMARY

CHAPTER 1	INTRODUCTION	1
	SITE SELECTION GOALS AND OBJECTIVES	1
	BACKGROUND	2
	PHASE 4A SITE EVALUATION PROCESS	3
	SCOPE AND LIMITATIONS OF THE ANALYSIS	8
	DATA COLLECTION AND ANALYSIS	14
	PUBLIC AND AGENCY CONTACTS	16
	REPORT ORGANIZATION	16
CHAPTER 2	REFINEMENT OF SITE BOUNDARIES	18
	INTRODUCTION	18
	ANALYSIS FRAMEWORK AND ASSUMPTIONS	22
	IDENTIFICATION OF FACTORS	22
	DATA COLLECTION AND ANALYSIS	23
	Constraint Mapping Analysis	24
	Preferred Site Boundaries	26
CHAPTER 3	ACCESS ROADS	28
	INTRODUCTION	28
	Purpose	28
	Organization of Chapter	28
	DESCRIPTION OF OPTIONS	29
	FRAMEWORK AND ASSUMPTIONS	36
	PRELIMINARY PHASE 4A ANALYSIS	36
	Identification of Indicators	36
	Data Collection and Analysis	37
	Ranking and Aggregation	39
	Results	40
	PHASE 4A ANALYSIS	42
	Identification of Factors	42
	Data Collection and Analysis	44
	Existing Environment	44
	Screening of Factors	47
	Ranking and Aggregation of Factors	48
	Results	48

CHAPTER 4	**RAIL ACCESS OPTIONS**	55
	INTRODUCTION	55
	Framework and Assumptions	55
	CONSTRAINT MAPPING	56
	Study Methods	56
	Selection of Factors and Indicators	57
	Data Collection	58
	Ranking of Factors and Indicators	59
	Results	60
	COMPARATIVE EVALUATION OF RAIL OPTIONS	60
	Identification of Factors	67
	Data Collection and Analysis	68
	Existing Environment	70
	Ranking and Aggregation	74
	Results	75
CHAPTER 5	**LOCATION OF PHYSICAL/CHEMICAL TREATMENT PLANT FOR PARTIALLY INTEGRATED SITING OPTIONS**	79
	INTRODUCTION	79
	FRAMEWORK AND ASSUMPTIONS	80
	IDENTIFICATION OF FACTORS AND INDICATORS	82
	DATA COLLECTION AND ANALYSIS	84
	Ranking of Options	86
	Preferred Siting Options	87
CHAPTER 6	**COMPARISON OF SITING OPTIONS**	88
	INTRODUCTION	88
	Purpose and Scope	88
	Chapter Organization	88
	FRAMEWORK AND ASSUMPTIONS	89
	IDENTIFICATION OF FACTORS, INDICATORS AND SUB-INDICATORS	93
	Site	96
	Site Vicinity	99
	Community	101
	Region	104
	Access Roads	108
	DATA COLLECTION AND ANALYSIS	109
	Data Collection	109
	Analysis	111
	BASIC ACCEPTABILITY	115
	EXISTING ENVIRONMENT	116
	Description of Options	116
	Siting Option LF-1E	124

CHAPTER 6 **COMPARISON OF SITING OPTIONS** cont'd

Siting Option LF-1E/PI-27E 124
Siting Option LF-9C 125
Siting Option LF-3C 126
Siting Option LF-4N/PI-1N 127
Siting Option LF-4N/PI-13N 128
DATA ON SITING OPTIONS FOR COMPARATIVE ANALYSIS 129
SCREENING AND MODIFICATION TO FACTORS AND INDICATORS 129
RANKING AND AGGREGATION OF FACTORS AND INDICATORS 129
Indicator Scaling 139
Indicator Ranking 139
Indicator Scoring and Aggregation 144
Factor Suitability Levels 144
Factor Ranking 144
Factor Scoring and Aggregation 160
COMPARISON OF SITING OPTIONS 160
SENSITIVITY ANALYSIS 164

CHAPTER 7 **CONCLUSIONS** 176

LIST OF APPENDICES

(A) PHASE 4A FACTOR SHEETS

(B) DATA COLLECTION AND COMPILATION

(C) STUDY METHODS

(D) EXISTING ENVIRONMENT OF SITING OPTIONS

(E) ACCESS ROAD ANALYSIS AND LOCATION OF THE PHYSICAL/CHEMICAL TREATMENT PLANT - DATA TABLES

(F) FACILITY CHARACTERISTICS

(G) CALCULATIONS OF FACTOR SUITABILITY LEVELS AND FACTOR SCORES FOR SITING OPTIONS

(H) REFERENCES

LIST OF TABLES

1-1	LINKAGE OF THE AGRICULTURAL STUDY TO OTHER PHASE 4A STUDIES	4
1-2	STUDY AREA BOUNDARIES AND RATIONALE	9
1-3	PHASE 4A FACTORS AND INDICATORS	10
1-4	FACTORS USED IN COMPARISON OF OPTIONS	12
3-1	ACCESS ROAD OPTIONS CONSIDERED IN PRELIMINARY PHASE 4A	30
3-2	ACCESS ROAD OPTIONS CONSIDERED IN PHASE 4A ANALYSIS	33
3-3	PREFERRED ACCESS ROAD OPTIONS SELECTED IN PHASE 3B	35
3-4	RATIONALE FOR SELECTION OF FACTORS	38
3-5	RATIONALE FOR RANKING OF FACTORS	41
3-6	FACTORS CONSIDERED IN THE PHASE 4A ANALYSIS OF ACCESS ROAD OPTIONS	43
3-7	RATIONALE FOR RANKING OF FACTORS	49
3-8	PHASE 4A FACTOR SCALING AND OPTION RANKING	50
4-1	INDICATOR VALUES FOR RAIL ACCESS OPTIONS	71
4-2	COMPARATIVE EVALUATION OF OPTIONS	76
4-3	RAIL ACCESS ANALYSIS RATIONALE FOR RANKING OF FACTORS	77
6-1	STUDY AREAS AND TIME FRAMES	92
6-2	SUMMARY OF DATA SOURCES FOR AGRICULTURAL INDICATORS	97
6-3	COMPARISON OF PHASE 3B AND PHASE 4A SENSITIVE CROP LISTS	107
6-4	PREFERRED ACCESS ROADS AND PARTIALLY INTEGRATED OPTIONS	123
6-5	DETAILED COMPARATIVE EVALUATION OF SITING OPTIONS	130
6-6	CHANGE IN PRELIMINARY FACTORS/INDICATORS	132
6-7	SCALING OF INDICATORS AND SUB-INDICATORS	140
6-8	SUB-INDICATOR WEIGHTS AND RATIONALE	142
6-9	RATIONALE FOR RANKING OF INDICATORS	143
6-10	FACTOR SUITABILITY LEVELS	145
6-11	RATIONALE FOR RANKING OF FACTORS	158
6-12	FACTOR AGGREGATION BY STUDY AREA	161
6-13	COMPARISON OF SITING OPTIONS	162
6-14	SENSITIVITY ANALYSES	165
6-15	SENSITIVITY ANALYSIS OF INITIAL AND REVISED FACTOR RANKING	167

LIST OF TABLES cont'd

6-16	ALTERNATE FACTOR RANKING	168
6-17	SUMMARY RESULTS OF SENSITIVITY ANALYSIS	169

LIST OF FIGURES

1-1	FACILITIES DEVELOPMENT PROCESS	5
1-2	PHASE 4A SITE EVALUATION PROCESS	6
2-1	REFINEMENT OF SITE BOUNDARIES - LF-3C	19
2-2	REFINEMENT OF SITE BOUNDARIES - PI-1N	20
2-3	REFINEMENT OF SITE BOUNDARIES - LF-1E	21
4-1	RAIL OPTIONS - LF-9C	61
4-2	RAIL OPTIONS - LF-3C	62
4-3	RAIL OPTIONS - LF-4N	63
4-4	RAIL OPTIONS - LF-1E	64
4-5	RAIL OPTIONS - PI-1N	65
4-6	RAIL OPTIONS - PI-27E	66
5-1	SCHEMATIC OF PARTIALLY INTEGRATED SITING OPTIONS	81
6-1	SITING OPTION LF-1E	117
6-2	SITING OPTION LF-1E/PI-27E	118
6-3	SITING OPTION LF-9C	119
6-4	SITING OPTION LF-3C	120
6-5	SITING OPTION LF-4N/PI-1N	121
6-6	SITING OPTION LF-4N/PI-13N	122

EXECUTIVE SUMMARY

PURPOSE

This report presents the results of the agricultural analysis that was undertaken as part of Phase 4A of the Ontario Waste Management Corporation (O.W.M.C.) site selection process. The purpose of the Phase 4A Comparative Evaluation Stage was to select, from among eight candidate sites, a preferred siting option for a facility to treat and dispose of liquid industrial hazardous waste (special waste). The eight candidate sites were identified in the previous stage (Phase 3B) of the site selection process (M.M. Dillon, 1984).

Presented in the report are the factors used to address agricultural concerns, the rationale for selection of these factors, data sources, analysis methods and results of the analysis. The report documents the analysis up to the point where agricultural factors are ranked and siting options compared from the point of view of agriculture. Documentation of the application of the agricultural factors to the overall site evaluation process is found in Site Selection Process. Phase 4A: Selection of a Preferred Site(s) - Site Selection (M.M. Dillon, 1985a).

BACKGROUND

Before it was possible to compare siting options, it was necessary to select the preferred components of each option. These components include the refinement of site boundaries, access routes, and the location for the physical/chemical treatment plant relative to the incineration and landfill facilities.

The O.W.M.C. adopted a multi-step approach to the site evaluation process. The steps involved were as follows:

1. Refining of site boundaries - delineation of preferred site boundaries within oversized sites: LF-3C, PI-1N and LF-1E.
2. Comparison of access road alternatives.
3. Comparison of rail access options.
4. Comparison of partially integrated siting options - determination of the location of the physical/chemical treatment plant on either of the incinerator or landfill sites for the LF-1E/PI-27E, LF-4N/PI-13N and LF-4N/PI-1N siting options.
5. Basic acceptability analysis - determination of technical or environmental constraints which could preclude a site or sites from further consideration.
6. Detailed comparative evaluation - screening and combining of factors and indicators and the comparison of siting options.

The first stage is documented in Chapter 2, the second in Chapter 3, the third in Chapter 4, the fourth in Chapter 5 and the fifth and sixth in Chapter 6. Chapter 7 presents the conclusions of the analysis.

SCOPE AND METHODS

The Phase 4A analysis was guided by a series of goals and objectives and by assumptions about facility characteristics.

Three goals were formulated by O.W.M.C. to guide the site selection process. They are, ranked from the most to least important:

- to select a site which minimizes risk to human health;
- to select a site which minimizes environmental impact;
- to minimize financial costs to O.W.M.C. and to the people of Ontario.

The second goal guided the development of specific agricultural objectives: to minimize impacts on present and future land productivity, to minimize impacts on local and regional agricultural economic systems, and to minimize impacts on agricultural communities. Data inputs were also provided to the Ontario Research Foundation (O.R.F.) and to Environ Limited for analysis relative to the first goal.

It was necessary to make a number of assumptions about the characteristics of the facility components (incinerator, physical/chemical treatment plant, [including a solidification plant] and landfill) and associated activities, such as truck traffic, and the potential effects which may result to agriculture from placing these components in different geographic settings. Facility characteristics assumptions assisted in the definition of study areas around the candidate sites and along potential access roads and rail alignments. They also helped to determine the implications of the facility operations on agricultural resources, e.g. disruption of adjacent farms, and emissions effects on crops and livestock. The facility characteristic assumptions employed at each stage of analysis are listed in relevant chapters and summarized in Appendix F.

Phase 4A builds upon the factors and study methods employed in Phase 3B. Agricultural factors were defined relative to a number of study areas - the site, adjacent and non-adjacent farm properties, access roads, rail acess options, the local and regional agricultural community, and a number of air dispersion zones. The number of agricultural factors was substantially increased. In many cases factors were subdivided into indicators and sub-indicators to better differentiate between and allow for measurement of some of the relative agricultural impacts among options.

The factors utilized and the study zones to which they applied are outlined below. They are divided into two lists. The first list contains the factors as used in the evaluation of components (site boundaries, access roads, rail access, location of physical/chemical treatment plant) and the second list contains the detailed comparative evaluation factors for siting options:

FACTORS USED IN THE EVALUATION OF SYSTEM COMPONENTS

COMPONENTS	FACTORS
. Refinement of Site Boundaries	. Soil capability . Farms with headquarters . Cropland
. Evaluation of Alternate Access Roads - Preliminary Phase	. Active farm complexes . Farm complexes with livestock . Soil Capability . Sensitive crops . Length
. Evaluation of Alternate Access Roads	. Loss of land . Farm machinery movements . Number of customer stops . Number of service vehicle stops . Area of crops in corridor . Livestock/poultry housed in corridor . Cattle crossings

COMPONENTS	FACTORS
. Evaluation of Rail Access Alternatives	. Proximity to farm buildings . Severance of farm parcels . Cropland in corridor . Loss of farmland
. Location of Physical/Chemical Treatment Plant	. Disruption of existing farm operations . Disruption to agricultural community

DETAILED COMPARATIVE EVALUATION OF SITING OPTIONS

STUDY AREA	FACTORS
. Site	. Displacement of farms with on-site headquarters . Loss of farmland
. Vicinity	. Partial displacement of farms (i.e., loss of on-site lands by farms with off-site headquarters) . Disruption of adjacent farm operations . Disruption of non-adjacent farm operations
. Community	. Stability of the farm population . Stability of the agricultural land base
. Region	. Disruption to the farm economy
. Access Roads	. Disruption to farm traffic and cattle crossings . Disruption to crop and livestock production

In Phase 4A several new, primary information sources were introduced within the site, vicinity and local community study areas. These included interviews with farm operators, on-site soil surveys and meetings with public groups and agencies. Secondary data sources were used for analyses within the larger regional study area.

At each stage of the analysis, a ranking procedure was applied to the factors, indicators and sub-indicators for the options being compared. The final scores indicate the relative impact potential for each factor among siting options.

An important aspect of the analysis was consultation with public groups and agencies to collect data, review the completeness of the site and vicinity interview data, and review the agricultural factors, weighting and ranking procedures.

PREMISES

The following information was provided by O.W.M.C. and other site selection consultants:

Monenco Limited

- facilities characteristic assumptions

Ontario Research Foundation

- the nature, dispersion and ground level concentrations of stack and fugitive emissions
- the air dispersion zones (0-2, 2-5, 5-20 km)
- crop and livestock exposure indices

Institute of Environmental Research Inc.

- age of farm operators
- number of rural residences (farm and non-farm)

Leon Kentridge Associates Limited

- mapping and documentation of land use designations

M.M. Dillon Limited (Transportation)

- agricultural vehicle impact index
- size of impact zone along access roads and rail spur lines

Any comments and qualifications regarding the data in the reports noted above, apply to this report as well.

Information and comments from citizen groups and public agencies were obtained through the consultation program co-ordinated by O.W.M.C. in consultation with the site selection consultants. This input related to the choice and ranking of factors and indicators. Considerable data on livestock populations were obtained through meetings with local farmers. Site, site vicinity and some of the access road data came from interviews with farm operators.

POSTULATES

In each stage of the Phase 3B and 4A site selection process, the basic postulate of the agricultural analysis was that agricultural concerns are best addressed within a perspective of minimizing the impacts on the agricultural production system. Significant, unmitigable impacts to the land base, farm economy, and farm population could affect the viability of the production system and, in turn, affect the well being of the community.

Because agriculture is a complex biophysical, social and economic system, the analysis employed a broad range of factors and indicators to describe the relevant components of the agricultural production system and to determine the relative potential for impact.

The analysis was carried out with full recognition that our knowledge about the precise nature and extent of agricultural impacts that can result from such a facility is limited. Although the amount of land to be transferred to non-agricultural uses and the number of farms displaced on-site can be measured, other potential impacts such as land value changes cannot be accurately forecast and measured. Notwithstanding these limitations, it was determined that the comparative evaluation analysis could be undertaken by measuring and comparing in a relative sense the attributes of agriculture.

The detailed comparative evaluation of siting options was based to the extent that the data would permit, on future conditions when the plant is in operation. This meant that agriculture on any lands designated in Official Plans for residential, institutional, commercial or industrial uses was assumed to be displaced either by the O.W.M.C. facilities or by another industrial use. In these cases, existing agricultural uses were not included in the comparative evaluation. A series of sensitivity analyses were performed to test the implications of these various assumptions on the final ranking of the siting options.

STATUS OF THE DATA

The data employed in the Phase 4A site selection were largely obtained from primary sources. Sources include interviews with farm operators in the site, vicinity and access road study areas, on-site sampling of agricultural soils, roadside and aerial surveys of crops (access roads), and interviews with Ontario Ministry of Agriculture and Food (O.M.A.F.) personnel and area farmers to assemble a livestock inventory (2-5 km zone).

The farm interviews for the site and vicinity and along access roads within the vicinity were undertaken in conjunction with the Institute of Environmental Research (I.E.R.) who conducted non-farm interviews. These were completed under the `Walk and Talk´ program, coordinated by the O.W.M.C. A very high degree of cooperation was received from interviewees and a high level of participation achieved in the interviews. Consultants cross-checked results for completeness of coverage and reviewed maps and data tables with local groups.

The access road interviews outside of 2 km were undertaken jointly by Ecologistics Limited and I.E.R. In some cases, interviews could not be accomplished with farm operators. Sufficient data for these farms were obtained by roadside observation (crops) and extrapolation from neighbouring farms (vehicle movements).

Secondary source data were used for comparison of the larger study areas. These include the 1981 Census of Agriculture, Statistics Canada (5-20 km zones of air dispersion analysis, and regional agricultural community), the Canada Land Inventory (CLI) (vicinity soil capability analysis), Land Use Systems Mapping, 1981 (2-5 km zone of air dispersion analysis) and Annual Agricultural Statistics from O.M.A.F. (all air

dispersion zones). Ministry of Revenue Assessment data (December, 1983) were used as the source for the location of property boundaries, and for the site, vicinity, access road and railroad study areas.

REFINEMENT OF SITE BOUNDARIES

Information employed during the refinement of site boundaries was obtained from on-site soil surveys and the site and vicinity interviews with farm operators. Data mapped at a scale of 1:10,000 were reviewed and interpreted by a ranking system showing the relative level of constraint to agriculture. The process was limited to data which could be mapped at a scale of 1:10,000. Some information which could not be mapped as constraints (severance of property boundaries and size of land parcel) was taken into consideration during the interpretation.

ALTERNATE ACCESS ROADS

Data collection, analysis and interpretation of access roads took place in the following two steps:

1. a preliminary screening of alternative access roads carried forward from the Phase 3B analysis;
2. a detailed analysis of the alternatives remaining after Step 1 and selection of preferred roads.

In the first step data from the Phase 3B analysis were reviewed, refined and interpreted at a 1:50,000 scale.

In the second step, new data were obtained from the farm interviews and crop inventory. Data collection and analysis focused on the disruption to adjacent farming activities on local and regional/provincial highways and land losses due to road widening. M.M. Dillon designated an

800 m impact zone and calculated an agricultural vehicle impact index from data on farm vehicle movements provided by the agricultural consultant. Working maps were compiled at a scale of 1:10,000 and the data were analyzed through the use of rating tables.

RAIL ACCESS OPTIONS

The data collection and analysis of alternate spur lines to the sites were undertaken in two steps:

1. the preparation of constraint maps to assist in the delineation of alternate rail corridors to the sites,
2. an evaluation of the rail access option.

In Step 1, agricultural constraints to the placement of a rail line within a study area extending from existing main rail lines to the sites were mapped at a scale of 1:10,000. Data on cropland and farm buildings were obtained from the farm interviews and Ministry of Revenue assessment rolls. When the study areas extended beyond the areas covered by the interviews (beyond 2 km from the site) data were collected by windshield surveys.

For the evaluation of access options in Step 2, a table of impact data for agricultural activities within 250 m and 170 m of each option was prepared. These impact zones were defined by M.M. Dillon (1985b).

LOCATION OF THE PHYSICAL/CHEMICAL TREATMENT PLANT

For the determination of the preferred location of the physical/chemical treatment plant (i.e. with the incinerator or with the landfill in the case of partially integrated siting options) factors and data were chosen which would show relative differences in the impact potential on the

agricultural community within 2 km of the sites and along access routes. Data sources included the site and vicinity and access road questionnaires. The agricutlural vehicle impact index calculated by M.M. Dillon was also used.

DETAILED COMPARATIVE EVALUATION OF SITING OPTIONS

The detailed comparative evaluation addressed displacement of farm operations and farmland, potential disruption of vicinity and access road farms the local agricultural community and the regional agricultural economy.

Data were used from site, vicinity and access road interviews, on-site soil surveys, meetings with local farm people and agencies, 1981 Census of Agriculture, Agricultural Land Use Systems mapping, CLI Soil Capability maps (1:50,000), assessment rolls and other site selection consultants as described on pages vi and vii.

For use in the comparative evaluation of sites some of the data were converted into a form more appropriate for comparison purposes. For example, crop and livestock data were integrated with the air dispersion modelling of the Ontario Research Foundation O.R.F. (1985) to obtain relative exposure indices for stack and fugitive emissions. Farm machinery trip data were combined with data on O.W.M.C. truck traffic to yield an agricultural vehicle impact index (M.M. Dillon, 1985b).

SCALING AND RANKING OF FACTORS AND INDICATORS

Relative differences in the degree of potential impacts among the options were identified through a scaling of indicator and sub-indicator data. This procedure converted data values to ordinates on a 0 to 6 scale. For consistency of approach among the site selection consultants, the scale ranged from 0 to 6, in both the positive and negative directions to indicate positive and negative impacts. Level -6 on the scale implied an exclusionary impact level. None of the agricultural scaling included level -6 impacts.

Indicators were ranked on a 1 to 5 scale to show levels of importance of indicators within factors; factors were also ranked on a 1 to 5 scale to show relative levels of importance. Initial rankings were presented to the public for comment. Based on the comments received, changes were made in the factor ranking. Generally, site factors were dropped one level while community and regional factors were elevated one level. The following list shows the final factor ranking for the detailed comparative evaluation:

Site	Rank
. Displacement of farms with on-site headquarters	3
. Loss of farmland	3
Vicinity	
. Partial displacement of farms	4
. Disruption of adjacent farm operations	5
. Disruption of non-adjacent farm operations	5
Community	
. Stability of farm population	5
. Stability of agricultural land base	4

Regional

. Disruption to farm economy	4

Access Roads

. Disruption to farm traffic and cattle crossings	4
. Disruption to crop and livestock production	2

NOTE: Level 5 is the highest rank and level 2 is the lowest.

FINDINGS

The analysis of constraints for refining site boundaries identified several features of an agricultural character at Sites LF-3C, PI-1N and LF-1E that were avoided in the delineation of the preferred boundaries.

The comparison of alternate access roads lead to the selection by the site selection team of preferred routes to each siting option. The preferred routes, especially those to LF-3C and LF-9C were also preferred from an agricultural perspective.

The evaluation of locations for the physical/chemical treatment plant lead to the conclusion that, for each partially integrated site, the physical/chemical treatment plant should be located with the incinerator. This preference was consistent with the results of the agricultural analysis.

In the basic acceptability analysis, no agricultural constraints were identified which would preclude giving a site further consideration. However, because of natural containment reasons, O.W.M.C. decided that Site LF-2N did not pass the basic acceptability test and it was eliminated in May, 1985. This resulted in siting options LF-2N/PI-1N and LF-2N/PI-13N being dropped from further consideration.

In the detailed comparative evaluation of the remaining six siting options, the agricultural analysis concluded that siting options LF-1E/PI-27E and LF-1E were substantially preferred over the remainder of the sites. Options LF-3C and LF-4N/PI-13N were considered the least favourable. Options LF-9C and LF-4N/PI-1N were ranked in an intermediate position but much closer to LF-3C, LF-4N/PI-13N than to the other two. LF-4N/PI-1N was slightly more preferred than LF-9C.

The order of preference of siting options from an agricultural viewpoint was as follows, from most to least preferred:

- LF-1E/PI-27E
- LF-1E

- LF-4N/PI-1N
- LF-9C

- LF-4N/PI-13N
- LF-3C

Siting option LF-1E/PI-27E was most favoured because it had the lowest site, site vicinity, community, regional and access road impact potential. The industrial designation of Site PI-27E and its close proximity to an existing mix of heavy and light industrial uses strongly influenced the preference for this option. Agriculturally, there is good reason to place the industrial facilities (incinerator and physical/chemical plant) on an industrial site away from active agriculture.

Option LF-1E was next preferred because of low impact potentials in the site vicinity, community, region and access road factors. The site would be in a relatively unstable agricultural area where many small scale hobby farms and non-agricultural activities occur.

Siting option LF-9C and LF-4N/PI-1N were closely ranked. Site LF-9C was less preferred because of higher vicinity, community and regional impact potentials.

There was a relatively small separation between LF-3C and LF-4N/PI-13N as well. Siting option LF-4N/PI-13N consists of two sites (larger size) but is situated in a less stable agricultural community, whereas LF-3C occupies a smaller area but is, like LF-9C, in a stable agricultural community. The least preferred of the two was LF-3C.

The results of the factor aggregation analysis were utilized by the site selection team in a pair-wise comparison of sites. Documentation of that work is found in the Site Selection report (M.M. Dillon, 1985a).

After reviewing the consultants' analyses O.W.M.C. selected LF-9C as the preferred site. The reasons for this choice are found in Facilities Development Process and Phase 4A Report. (O.W.M.C., 1985).

CONCLUSIONS

A general assessment of potential residual impacts followed the selection of the preferred site. These were potential impacts that would not be fully resolved through the facility design, site-specific design modification and policy initiatives that were considered in the detailed comparative evaluation.

The types of residual agricultural impacts that are anticipated relate to property value impacts, uncertainty about airborne emissions, attitudes of consumers, displacement of farm families and their businesses.

CHAPTER 1

INTRODUCTION

This report documents the agricultural analysis and interpretation undertaken as part of the Ontario Waste Management Corporation (O.W.M.C.) Phase 4A site selection process. The purpose of Phase 4A was to select a preferred siting option for a waste treatment and disposal facility. A detailed comparative evaluation was undertaken of the eight siting options identified in Phase 3B of the site selection process. The report, SITE SELECTION PROCESS PHASE 3B: SELECTION OF CANDIDATE SITES, Agriculture, describes in full, details of the agricultural input to the selection of the eight siting options.

This report documents the Phase 4A agricultural analyses that fed into the selection of the preferred siting option. Documentation of the Phase 4A site selection process as a whole appears in Site Selection Process. Phase 4A: Selection of a Preferred Site(s) - Site Selection (M.M. Dillon, 1985a).

SITE SELECTION GOALS AND OBJECTIVES

As in Phase 3B, three O.W.M.C. site selection goals guided the site selection process; these were in order of priority:

- to minimize risk to human health,
- to minimize environmental impact, and
- to minimize financial costs to O.W.M.C. and the people of Ontario.

Agricultural concerns relate mainly to the second goal. However, agricultural data inputs were also provided to the Ontario Research Foundation (O.R.F.) and to Environ Limited for their use in evaluating risk to human health via pathways through crops and livestock.

In keeping with the overall O.W.M.C. goals and the Phase 3B agricultural objectives, agricultural objectives for Phase 4A were established as follows: to minimize the impact on productive agricultural soils, agricultural economic systems, and the agricultural community.

In response to the above objectives, the agricultural consultant selected factors which describe the relevant characteristics of agriculture, and, based on an evaluation of these factors, assessed the relative potential for impacts on agriculture of a waste treatment facility installation.

BACKGROUND

In previous phases of the O.W.M.C. site selection process, broad candidate regions and areas were analysed in order to eventually identify a number of candidate sites. Analysis in these early phases relied mainly upon existing data from secondary sources. Following the identification of candidate sites in Phase 3B, it was possible in Phase 4A to obtain and utilize more primary data sources. A primary task in Phase 4A was to collect, compile and analyze primary site data within site, site vicinity, local and regional access road study areas for each of these sites.

For the agricultural analysis the site selection goals, the agricultural objectives and the results of Phase 3B provided a starting point for Phase 4A work. In particular, a number of Phase 3B analytic

procedures were employed. These were adapted and refined to enable a more detailed comparative analysis.

The factors utilized by the different O.W.M.C. Phase 4A consultants were, as in Phase 3B, closely related. Certain data were used by more than one consultant in their analyses. Also, several of the consultants were simultaneously engaged in data collection in the field so that co-ordination of data collection efforts was required. Because of this close interaction among consultants their individual reports are interrelated in terms of both data sources and analyses. Linkages between the agricultural study and other Phase 4A studies are outlined in Table 1-1. Specific data inputs from or to other O.W.M.C. consultants are noted throughout this report.

All of the field work and subsequent analyses conducted by O.W.M.C. consultants provided background information that was used in the detailed comparative evaluation. This evaluation, which is documented in the site selection report (M.M. Dillon, 1985a) had as its primary function, the task of synthesizing risk and impact data in order to identify which of the options under consideration best fulfilled the site selection goals.

PHASE 4A SITE EVALUATION PROCESS

The O.W.M.C. site selection process was undertaken in five phases (Figure 1-1). The fourth phase is comprised of two stages, the selection of a preferred site(s) (Phase 4A), and the detailed analysis of the preferred site(s) (Phase 4B).

The Phase 4A Site Evaluation Process was a staged procedure which involved four basic steps as illustrated in Figure 1-2. This process guided the work of the individual site selection consultants and provided

TABLE 1-1

LINKAGE OF THE AGRICULTURAL STUDY TO OTHER PHASE 4A STUDIES

STUDY	ANALYST	RELATIONSHIP TO AGRICULTURAL STUDY
Social Impacts	Institute of Environmental Research Inc. (IER)	- co-operative execution of site, vicinity and access-road interviews - joint effort to finalize land-ownership data for site and vicinity - IER provided operator age and farm/non-farm residence data - IER provided future scenario projections
Economic Impact	Clayton Research Associates Ltd.	- Ecologistics provided data on estimated gross farm revenue of on-site properties and 0-5 km study area farms and employment data for the on-site farm properties
Transportation	M.M. Dillon Ltd.	- Ecologistics provided volumes of farm vehicle traffic - Dillon provided calculations of agricultural vehicle impact indices
Site Selection	M.M. Dillon Ltd.	- Dillon provided overall direction and co-ordination regarding the site selection process
Surface Water and Biology	Gartner-Lee Associates Ltd. (GLAL)	- Ecologistics collected on-farm water-use data for GLAL - during farmer interviews Ecologistics secured permission for on-site surveys
Air Dispersion of Pollutant Emissions	Ontario Research Foundation (ORF) Environ Ltd	- Ecologistics provided crop and livestock data to ORF for calculations of exposure indices - ORF provided indices for exposure of agricultural resources to emissions - Ecologistics provided Environ with information on feed consumption rates
Analysis of Official Plans	Leon Kentridge and Associates Ltd. (LKA)	- LKA provided mapping and documentation of official land-use designations - LKA provided future scenario projections
Engineering	Monenco Ltd.	- provided facility characteristic assumptions

FIGURE 1-1:

FACILITIES DEVELOPMENT PROCESS

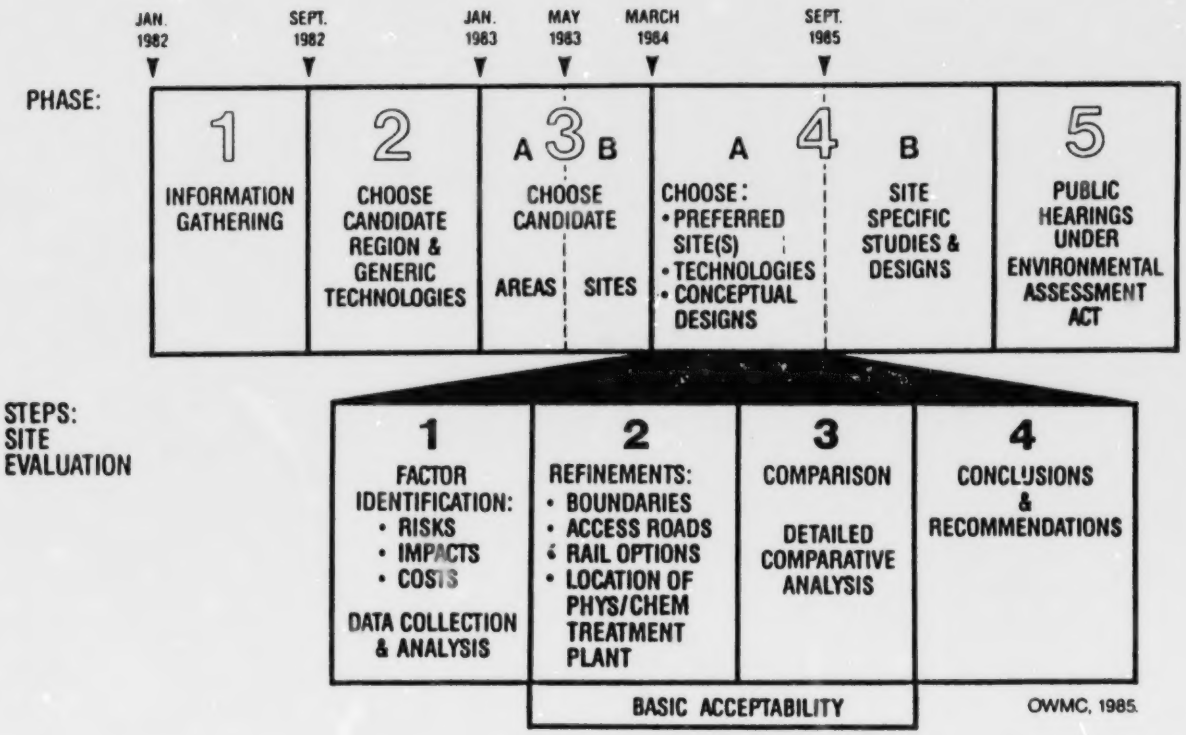
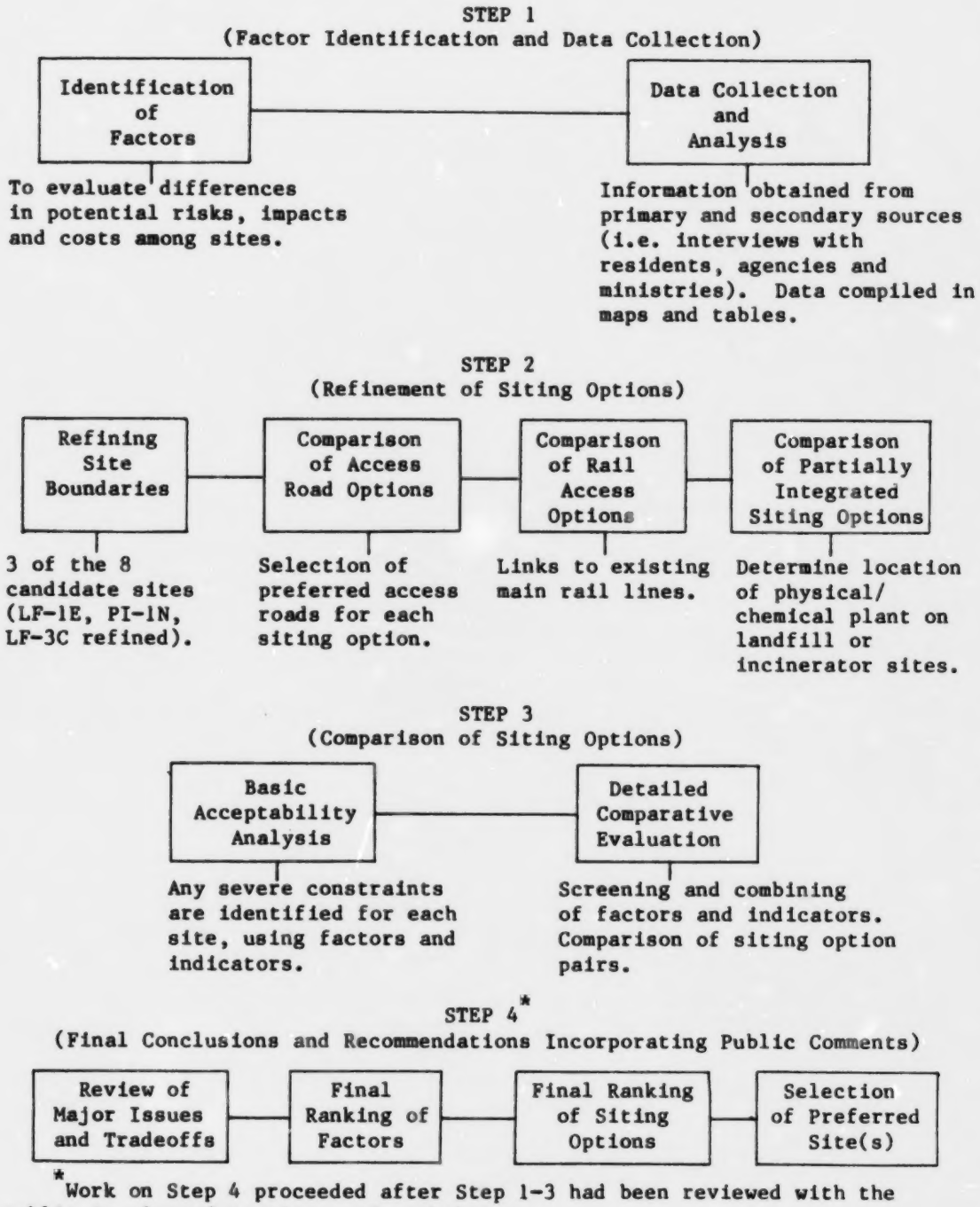


FIGURE 1-2

PHASE 4A SITE EVALUATION PROCESS


STEP 1
(Factor Identification and Data Collection)
Identification of Factors
Data Collection and Analysis
To evaluate differences in potential risks, impacts and costs among sites.
Information obtained from primary and secondary sources (i.e. interviews with residents, agencies and ministries). Data compiled in maps and tables.
STEP 2
(Refinement of Siting Options)
Refining Site Boundaries
Comparison of Access Road Options
Comparison of Rail Access Options
Comparison of Partially Integrated Siting Options
3 of the 8 candidate sites (LF-1E, PI-1N, LF-3C refined).
Selection of preferred access roads for each siting option.
Links to existing main rail lines.
Determine location of physical/ chemical plant on landfill or incinerator sites.
STEP 3
(Comparison of Siting Options)
Basic Acceptability Analysis
Detailed Comparative Evaluation
Any severe constraints are identified for each site, using factors and indicators.
Screening and combining of factors and indicators. Comparison of siting option pairs.
STEP 4*
(Final Conclusions and Recommendations Incorporating Public Comments)
Review of Major Issues and Tradeoffs
Final Ranking of Factors
Final Ranking of Siting Options
Selection of Preferred Site(s)

*Work on Step 4 proceeded after Step 1-3 had been reviewed with the public in planned meetings and workshops.

the framework for synthesizing the many separate analyses. Explanations of several of the steps are provided below.

1. Refining Site Boundaries - For three of the candidate sites identified in Phase 3B (LF-1E, LF-3C, PI-1N), on and off-site constraints were evaluated to provide a basis for refinement of boundaries.

2. Comparison of access road alternatives - Alternate access roads were evaluated and preferred roads identified for each siting option.

3. Comparison of rail access options - Detailed site and vicinity data were used to identify optimum links between sites and main rail lines. This analysis examined rail haulage of additives and reagents as a potential mitigation for access road impacts.

4. Comparison of partially integrated siting options - Determination of the location of the physical/chemical treatment plant on either of the landfill or incinerator sites. The siting options involved in this comparison were:
   - LF-4N/PI-13N
   - LF-4N/PI-1N
   - PI-27E/LF-1E

5. Basic acceptability analysis - Relative to technical requirements or critical environmental thresholds constraints were identified using factors and indicators.

6. Detailed comparative evaluation - Screening and combining factors and indicators to compare siting options:
   - LF-9C
   - LF-3C
   - LF-4N/PI-1N
   - LF-4N/PI-13N
   - PI-27E/LF-1E
   - LF-1E

Assumptions about facility characteristics facilitated the selection of factors which identify potential impacts on agriculture. These assumptions concern the site size, layout and design, facility operations, truck traffic volumes, employment levels, road and rail access requirements, atmospheric emissions, surface and groundwater drainage systems, and off-site service requirements. Details of these assumptions are outlined in Appendix F, and summarized wherever relevant in the following chapters.

Appropriate agricultural study areas were identified for each set of options under consideration. These study areas correspond to zones within which potential impact might occur. The zones and the rationale for their delineation are summarized in Table 1-2.

The factors selected for the Phase 4A analysis each encompassed a related set of potential impacts within a specific study area. A number of indicators and sub-indicators were used to describe the range of potential impacts (high to low) associated with each factor. In general, the factors are concerned with the displacement or disruption of farmland, farm operations and the agricultural community. Table 1-3 shows the factors and indicators and the correspondence between these and the Phase 3B factors. Table 1-4 shows the linkages between factors, study areas and stage of application in the comparison of options.

SCOPE AND LIMITATIONS OF THE ANALYSIS

While a detailed and site-specific approach to the analysis was required during Phase 4A, the scope of the analysis was somewhat limited by uncertainties about the nature and extent of agricultural impacts that may result from O.W.M.C. facility operations. This reflects the limited

TABLE 1-2

STUDY AREA BOUNDARIES AND RATIONALE

STUDY AREA	DIMENSIONS OF STUDY AREA	RATIONALE
Site	Site acquisition boundaries	All agricultural uses will be displaced within site acquisition boundaries.
Site Vicinity		
. Adjacent farm operations	Variable width but includes all farm properties adjacent to, or across the road from site boundaries	Includes farm operations most vulnerable to impacts (dust, noise, visual, air emissions, property value, uncertainty).
. Non-adjacent farm operations	Includes all farm properties between adjacent ones and those crossed by a line drawn 2 km from the site centre.	Farm operations are less vulnerable because of greater separation; interview data required for the analysis in this study area.
Local Community	Includes site acquisition and vicinity areas.	Farm operators and their families most affected in the local area; required interview data to perform analysis of impacts.
Region	Extends to a radius of 5 km from the site centre.	A larger socio-economic zone in which indirect effects could be felt on the general farming community and economy; data base derived from both primary and secondary sources.
Air Dispersion Zones	0-2, 2-5, and 5-20 km from the site centre	Defined by ORF (see ORF, 1985).
Access Roads	Includes all farmland within 800 m of the access road.	Defined by M.M. Dillon (1985b).
Rail Corridors	Includes all farmland on either side of rail access options -250 m for impacts from rail-related mishaps, 170 m for noise related impacts.	Defined by M.M. Dillon (1985b).

TABLE 1-3

PHASE 4A FACTORS AND INDICATORS

STUDY AREA	FACTOR	INDICATOR	CORRESPONDING PHASE 3B FACTOR
Site	Displacement of Farms with On-Site Headquarters	. no. of farms with on-site headquarters . average size of farms . estimated gross farm revenue	. farm building complexes
	Loss of Farmland	. soil capability . tile drainage	. soil capability
Vicinity	Partial Displacement of Farms	. no. of farm operations affected . average size of lost parcels . proportion of land base lost	. farm building complexes
	Disruption of Adjacent Farm Operations	. no. of farm operations with headquarters . no. of operators with owned land . livestock density	. farm building complexes . livestock densities
	Disruption of Non-Adjacent Farm Operations	. no. of farm operations with headquarters . proportion of non-adjacent vicinity in crops . livestock density	. farm building complexes . cultivated land . livestock densities
Community	Stability of Farm Population	. age of operators . full-time operators (percent of total operators)	

TABLE 1-3 - cont'd

PHASE 4A FACTORS AND INDICATORS

STUDY AREA	FACTOR	INDICATOR	CORRESPONDING PHASE 3B FACTOR
Community cont'd	Stability of Land Base	. land tenure	. land fragmentation
		. farm residences (percent of total residences)	
		. agriculturally designated land	. designated land use
		. private land ownership	. publicly owned land
Region	Disruption to the Farm Economy	. gross farm revenue	
		. relative exposure of crops and livestock to fugitive emissions	. sensitive crops
		. relative exposure of crops and livestock to stack emissions	
		. exposure of downstream livestock	
Access Roads	Disruption to Farm Traffic and Cattle Crossings	. local roads	
		. regional roads	
	Disruption to Crop and Livestock Production	. adjacent crops	. sensitive crops
		. adjacent livestock	. livestock populations
		. downstream livestock	

TABLE 1-4

FACTORS USED IN COMPARISON OF OPTIONS

FACTOR	STUDY AREA				COMPARISON OF ALTERNATIVES WITHIN SITING OPTIONS				BASIC ACCEPTABILITY OF OPTIONS*	COMPARISON OF SITING OPTIONS
	ACCESS ROAD	SITE	VICINITY	COMMUNITY REGIONAL	REFINEMENT OF SITE BOUNDARIES	ACCESS ROAD	RAIL OPTIONS	LOCATION OF PHYSICAL/CHEMICAL TREATMENT PLANT		
1) Displacement of farms with on-site headquarters		X			X				-	X
2) Loss of farmland		X		X	X	X	X			
3) Partial displacement of farms			X						-	X
									-	X
4) Disruption of adjacent farm operations			X				X	X	-	X
5) Disruption of non-adjacent farm operations			X						-	X
6) Stability of farm population				X					-	X
7) Stability of agricultural land base				X				X	-	X
8) Disruption to farm economy				X					-	X
9) Disruption to farm traffic and livestock crossings	X					X		X	-	X
10) Disruption to crop and livestock production (adjacent to access roads)	X					X			-	X
11) Cropland		X			X	X	X			
12) Farms with headquarters					X		X			

* No basic acceptability criteria were applied.

amount of research reported in the literature about the effects of facilities of this type on the agricultural community and its resource base.

Ideally, one would describe the affected environment, identify changes caused by the undertaking, identify resources or activities affected by those changes, describe the nature and extent of the resulting impacts and identify any measures available for mitigating those impacts. Most of this was possible but the primary restraints were felt in the area of predicting changes in measurable terms, especially indirect or secondary changes.

These information constraints have had a bearing on the analysis of the factors. Within each factor, a number of indicators and sub-indicators were used to relate to specific impact potentials. Instead of measuring these impacts directly, most of the indicators and sub-indicators describe or measure components of the agricultural production system that could be impacted.

Exceptions to this general approach to impact analysis include situations where impacts are direct and obvious such as the acquisition of lands on which to establish the O.W.M.C. facilities.

A further complication arose because the assessment of potential impacts must deal with a future time horizon, i.e. when the facilities are in operation. Of necessity, the predictions about future impact potentials had to be based largely on information about existing conditions.

To a limited extent, future conditions can be anticipated in the area of land use if municipalities have designated rural lands for future urban uses. Therefore, the assumption is made that lands designated in official

plans for residential, commercial or industrial uses will be removed from agriculture and thus bear none of the present agricultural features or characteristics. More discussion on this point is found in Chapter 6.

Notwithstanding, the above noted limitations, the scope of Phase 4A analysis was increased markedly in breadth and depth over that of Phase 3B. The amount and quality of the data available for use in the Phase 4A analysis were considered adequate for detailed comparative evaluation purposes.

In Phase 3B, 17 factors were used in the initial comparative evaluation of candidate sites. These factors which were not subdivided into indicators, were assessed using primarily secondary data sources. By contrast, 30 indicators, based largely on primary data collected in the field, were used in the Phase 4A comparative evaluation process. In Phase 3B, the analysis was limited to the site, the site vicinity and access roads. The Phase 4A analysis was extended to encompass local and regional agricultural communities, air dispersion zones and rail access options.

DATA COLLECTION AND ANALYSIS

In previous stages of the site selection process, when candidate regions and areas were examined for the selection of candidate sites, the detail provided by secondary data sources was sufficient. However, Phase 4A, required more detailed data for comparison of particular sites. Many of the available secondary data sources are too out of date and/or too general for the purpose of distinguishing, with confidence, relatively small differences among options. As well they allow for only relatively imprecise estimates of impact potential.

In Phase 4A better data were required and these were collected in the field by the O.W.M.C. consultants. The data sources employed were questionnaires for the site, vicinity and access road farms, on-site soil sampling, aerial and windshield surveys of crops, and interviews with local farmers and O.M.A.F. personnel for a livestock inventory. More information on these are found in the subsequent chapters.

Secondary sources were the only reasonable sources of data for comparing indicators covering large areas. These areas included the 5-20 km zones in the air dispersion analysis, the vicinity for soil capability analysis, and the regional agricultural community. Data sources included the 1981 Census of Agriculture (Statistics Canada), the Land Use Systems Mapping (Agriculture Canada and the Ontario Ministry of Agriculture and Food, 1983 and 1984), annual agricultural statistical publications (Ontario Ministry of Agriculture and Food), and maps of the Canada Land Inventory, Soil Capability Classification for Agriculture.

For a number of indicators the data collected were used directly in comparative evaluation. For others, the primary data were first analysed and converted into a form that was more useful for conducting the comparative evaluations. For example, livestock figures were summarized using a methodology based on a common animal unit measure. Soils data were summarized in a similar manner using soil productivity ratings to give Class 1 "equivalents." Data on air emissions and dispersion were combined with data on the level of agricultural activity in the exposure zones to give crop and livestock exposure indices. Farm traffic data were combined with data on O.W.M.C. truck movements to give an agricultural vehicle impact index.

The end product of the data collection and analysis tasks was either a table of indicator data for the various options, or in certain cases constraint maps. These served as the primary inputs into the comparative evaluation of options.

PUBLIC AND AGENCY CONTACTS

An important objective of the study process was to obtain input from citizens groups and public agencies throughout the study. Therefore, meetings were held during the study process to:

- obtain input on factors and indicators, data sources, and factor rankings;
- review updated mapping of soils and capability ratings;
- provide comments on the completeness of data collected in the site and vicinity questionnaires; and
- obtain crop and livestock information on a farm-by-farm basis for the 2-5 km study zone.

Input received from these meetings is summarized throughout this report.

REPORT ORGANIZATION

The report is structured so that it highlights the comparative evaluation process for each of the various options being considered. Therefore, the report chapters deal with the options as follows:

Chapter 2 - Refinement of Site Boundaries
- the identification of alternate site boundaries within oversized sites

Chapter 3 - Access Roads
- a comparison of alternate local and regional access roads

Chapter 4 - Rail Options
- a comparison of alternate corridors and rail spur line access into the sites

Chapter 5 - Location of Physical/Chemical Treatment Plant for Partially Integrated Siting Options
- an assessment of the relative impact of locating the physical/chemical plant with either the incinerator or the landfill

Chapter 6 - Comparison of Siting Options
- the basic acceptability analysis
- an overall comparison of the final siting options

Chapter 7 - Conclusions

CHAPTER 2

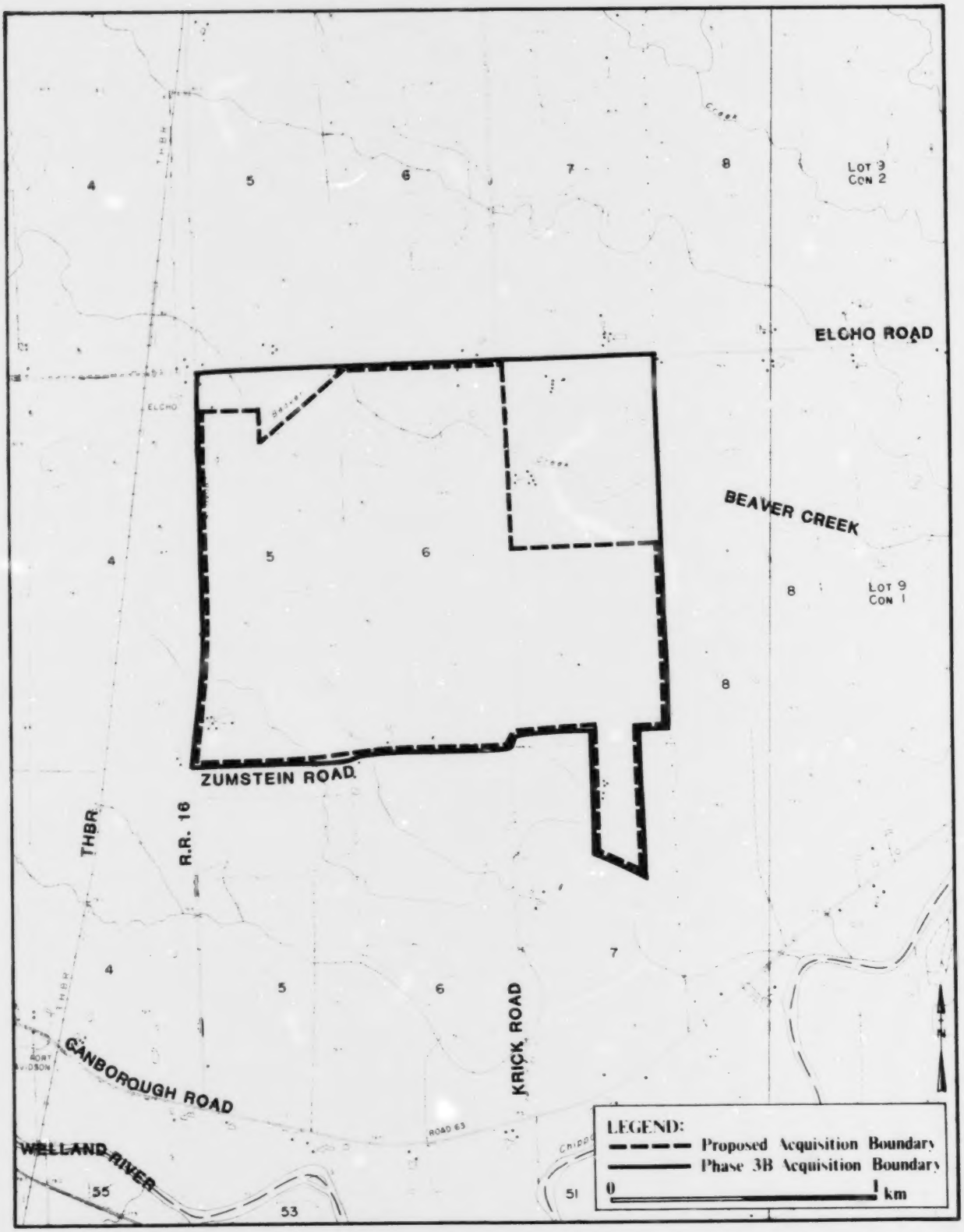
REFINEMENT OF SITE BOUNDARIES

INTRODUCTION

By the end of Phase 3B potential site acquisition areas had been identified for the eight candidate sites. Candidate sites LF-3C, PI-1N and LF-1E had acquisition areas that were considerably larger than necessary to house the waste treatment facilities, associated activities and the technical buffer zone. During Phase 4A, the size of each of these candidate sites was reduced. This chapter documents the agricultural analysis undertaken to help refine site boundaries for each candidate site. The original and refined site boundaries for LF-3C, PI-1N and LF-1E are illustrated in Figures 2-1 to 2-3.

The identification of refined site boundaries was undertaken in two steps. In the first, agricultural constraint maps were prepared. These were used together with several principles for siting non-agricultural land uses in agricultural areas. The results served as input to the site selection team. The team then refined the site boundaries so as to allow for adequate site area while avoiding constraint areas as much as possible.

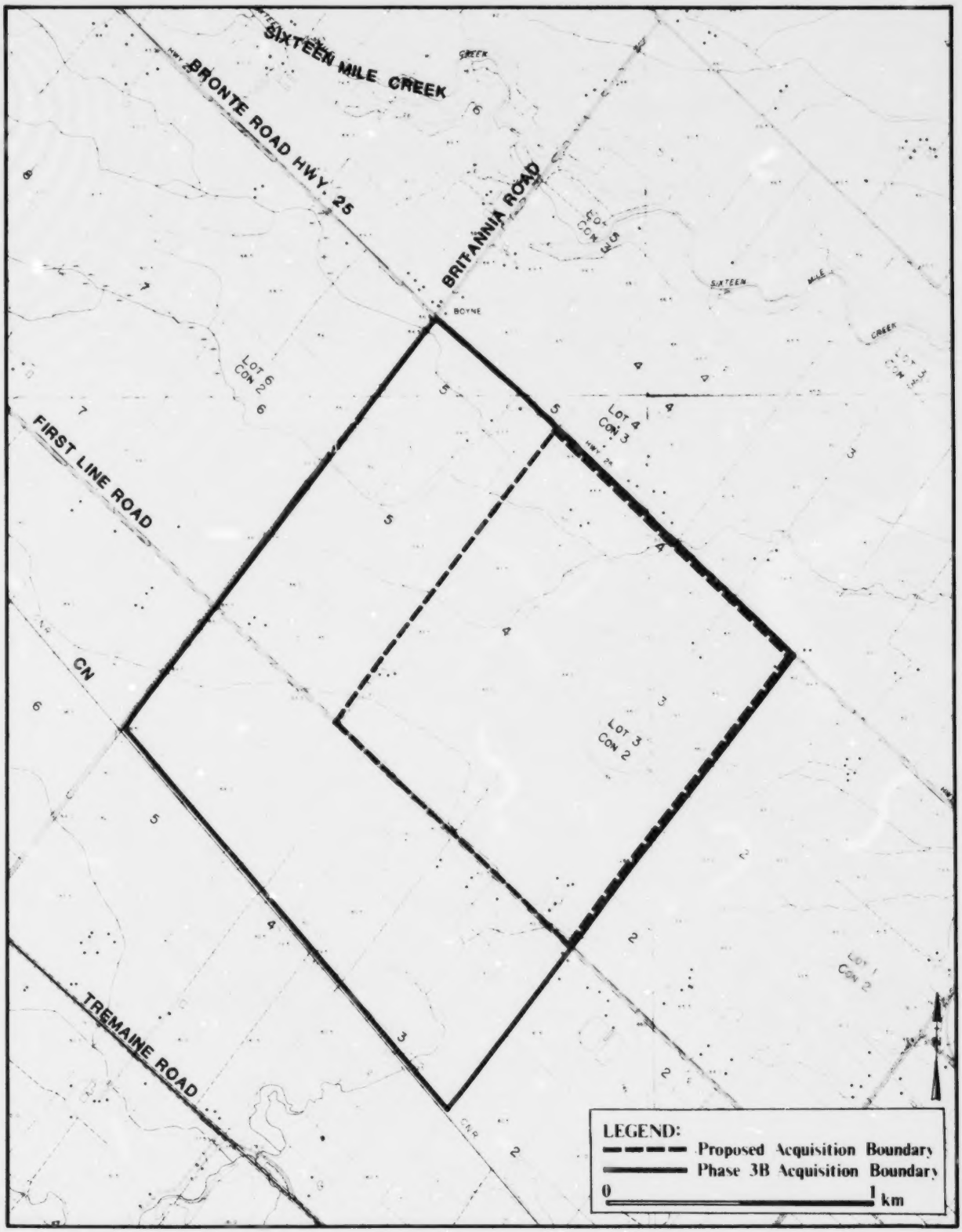
The remainder of this chapter outlines this constraint mapping process, the data sources and procedures for collection and analysis of data and the siting principles employed. It concludes with a summary of the agricultural considerations that influenced the refinement of site boundaries.



LF-3C

REFINEMENT OF SITE BOUNDARIES

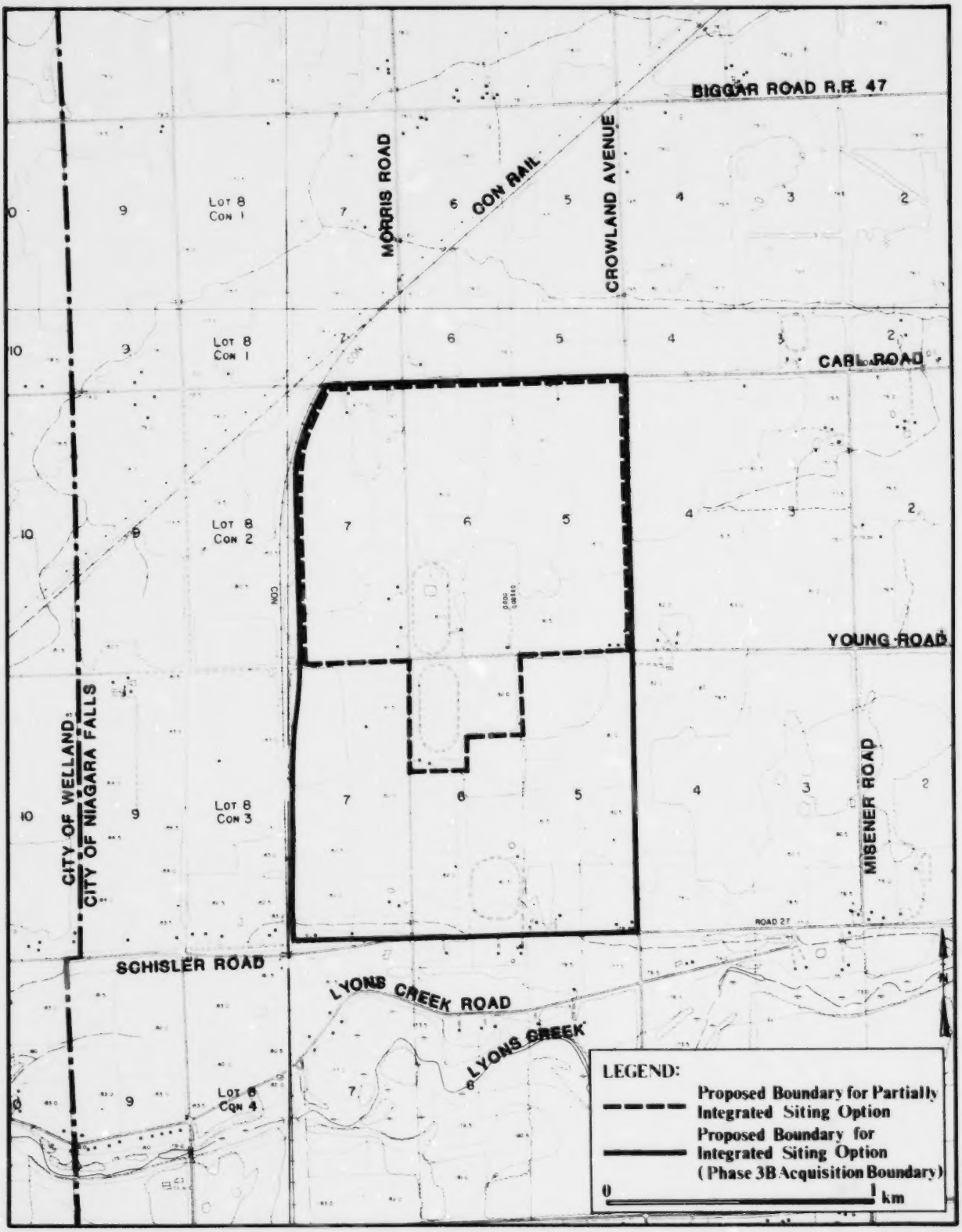
FIGURE 2-1



PI-1N

REFINEMENT OF SITE BOUNDARIES

FIGURE 2-2



LF-1E

REFINEMENT OF SITE BOUNDARIES

FIGURE 2-3

ANALYSIS FRAMEWORK AND ASSUMPTIONS

The main objective in terms of agriculture in the identification of site boundaries was to minimize the loss of high quality agricultural land and the displacement or disruption of active farm operations. Factors and indicators which address this objective were selected and indicator data were mapped at a 1:10,000 scale. Copies of the working maps are on file with Ecologistics Limited.

Each indicator was then ranked according to the level of potential impact to farmland and farm operations. Areas with the highest potential impact were considered the least suitable for the facilities, while the low impact areas were considered more suitable. Constraint levels were developed independently for each site based on the range of conditions within each site. Constraint level criteria are, therefore, not entirely comparable among the three sites.

IDENTIFICATION OF FACTORS

The following factors were selected for the delineation of agricultural constraints:

- soil capability
- farms with headquarters, owned versus rented
- cropland

The Canada Land Inventory (CLI) soil capability classification system was used to identify soils which have the highest crop production potential. Details of the CLI soil capability rating system are given in Appendix C. Areas with high soil capability are less suitable for inclusion within the site boundaries.

The factor, farms with headquarters, identifies active farm operations that could be displaced. The land tenure status of these farm operations was used as an indicator to help determine the relative level of impact. The highest impact would be associated with owned farms because of financial and personal ties to the operation. Site acquisition areas that avoid farms with headquarters and owned land were favoured.

Cropland indicates the intensity of existing agricultural land use. The effects on agricultural production of displacing land in crop production is greater than the displacement of land which is in a non-agricultural use.

DATA COLLECTION AND ANALYSIS

Data used in the delineation of agricultural constraints were obtained from the questionnaire survey of farm operators and from the on-site soil surveys. Details of these data collection and compilation procedures are included in Appendix B.

Soil Capability Classes

The capability classes on the Soil Capability Maps 1 to 8 located in Site Selection Process. Phase 4A: Selection of a Preferred Site(s) - Agriculture. Technical Data Map Portfolio (Ecologistics Limited and Deloitte, Haskins & Sells Associates; 1985), were generalized based on the dominant CLI rating. Where no particular rating dominated an area, a composite rating was indentified (e.g. Classes 1-3). The boundaries of these generalized units were marked on 1:10,000 scale working maps.

Farms with Headquarters

Information about farm properties, i.e. the location of the farm headquarters and the tenure status, was obtained from the questionnaires.

Data were compiled on 1:10,000 scale maps. The following five categories of tenure were identified on the maps:

- land farmed by the owner, with headquarters on the property,
- land farmed by the owner, with headquarters elsewhere,
- land farmed by a tenant with headquarters on the property,
- land farmed by a tenant with headquarters elsewhere,
- land not farmed.

Cropland

Lands under agricultural crops were identified on a field by field basis during site and vicinity interviews (see Appendix C). This information was transferred from the crop and livestock inventory field maps onto the 1:10,000 scale base maps. Cropland included specialty crops, winter wheat, oats, barley, mixed grains, rye, buckwheat, small grains, corn, soybeans and hay.

CONSTRAINT MAPPING ANALYSIS

A ranking system was developed to identify the relative level of constraint associated with the attributes of each factor. Areas with high potential impacts were considered a major constraint to the location of the revised site boundaries, while low impact areas were deemed suitable.

Each indicator was ranked on a three point scale as follows:

Factors	Indicators		
	High Constraint	Moderate Constraint	Little or No Constraint
Soil Capability Classes	1 and 2	1 - 3* 2 - 3	3-2, 3 or lower
Farms with Headquarters	land owned and farmed with headquarters on the property	land rented and farmed with headquarters on the property; land owned and farmed with headquarters elsewhere	rented farmland with no buildings; land not farmed
Cropland	specialty crops	other crops	land not cropped

*Class 1 and 3 soils dominate the local area; there are more Class 1 than Class 3 soils.

Soil Capability

A high constraint corresponds to the removal of the high soil capability Classes (1 and 2). A moderate constraint applies to areas with combinations of Classes 1 and 3 or 2 and 3 whereas a low constraint applies to Class 3 and lower capability soils.

Farm Headquarters

Farms operated by an owner with headquarters on the property were rated as high constraint. Moderate constraints are associated with land that is rented by a tenant with headquarters on the property and land farmed by an owner with headquarters elsewhere. Rented farmland with no buildings and land in non-agricultural uses were treated as low constraint areas.

Cropland

A high constraint level was assigned to specialty crops. If any were located within a site under consideration, it was recommended that the affected properties be avoided. Moderate constraints were assigned to other crops and uncropped lands were considered low constraint.

Other Considerations (Siting Principles)

Other agricultural considerations were taken into account during the refinement of site boundaries but which could not be mapped as constraints. These were property boundaries and the relative sizes of land parcels. The preference was to delineate site boundaries along property lines, thus avoiding the severance of land parcels and to avoid larger parcels that are actively used for agriculture.

PREFERRED SITE BOUNDARIES

Details of the refinement of site boundaries by the site selection team are outlined in the M.M. Dillon (1985) Site Selection report. Selection considerations from the point of view of agriculture are outlined below.

LF-1E

The north section was selected due to hydrogeologic constraints in the southern part of the site. The southern boundary of the site was delineated on the basis of property boundaries to minimize severances of parcels. Also this boundary avoids the main commercial farm in the southwest corner.

The general preference, agriculturally, was to locate in the north part of the site where there is a higher proportion of non-agricultural land use and the dominant soils are of a lower capability.

LF-3C

Land was required on both sides of Krick Road due to constraints related to Beaver Creek. Three properties to the north are avoided. All are farmed and two have Beaver Creek bisecting them.

PI-1N

The choice of the site boundaries for PI-1N was based mainly on hydrogeologic constraints and avoids large farmed parcels to the northeast.

CHAPTER 3

ACCESS ROADS

INTRODUCTION

PURPOSE

The purpose of this chapter is to document the agricultural study component dealing with access roads. This analysis was undertaken to describe and compare the relative agricultural impacts arising from O.W.M.C. facility traffic on alternate access roads extending from the 400 series highways to each site. It also addresses alternate routes between sites for partially integrated siting options. The analysis comprised two stages:

1. a preliminary screening of alternate access roads carried forward from Phase 3B for all siting options;
2. a more detailed analysis of the alternate routes and selection of preferred routes in cases where alternates still remained after the preliminary screening.

ORGANIZATION OF CHAPTER

This chapter is divided into sections that correspond to the steps carried out in the access road analysis.

First the access road options that were evaluated are described. Next, the assumptions and framework of the analysis are explained. Then, the preliminary screening stage of the analysis is described. Finally,

the second stage, the detailed analysis of options and the selection of preferred roads are outlined.

DESCRIPTION OF OPTIONS

The access road options analysed in the preliminary stage were those remaining after the Phase 3B analysis and some new ones identified by the transportation consultant (M.M. Dillon 1985b) in Phase 4A (Table 3-1). Two types of options were compared; those extending from 400 series highways along local and regional/provincial standard roads for the transport of untreated wastes and supplies to the sites, and those for the inter-site transfer of treated waste and treatment by-products where there are partially integrated siting options.

In the second stage, a detailed analysis was undertaken for those roads for which options remained after the first stage (to LF-3C, PI-27E and LF-1E), and the transfer routes between LF-1E and PI-27E and LF-4N and PI-1N (Table 3-2).

Preferred access road options to LF-4N, LF-2N, PI-1N, and PI-13N (from the QEW) and from PI-13N to LF-4N were selected in the Phase 3B stage of analysis (Table 3-3).

The location of all access roads addressed in this chapter are shown on figures in the site selection report (M.M. Dillon, 1985a).

TABLE 3-1

ACCESS ROAD OPTIONS CONSIDERED IN PRELIMINARY PHASE 4A

To LF-3C

1. from QEW - south on Vineland Townline Road (Regional Road 24); west on Highway 20; south on Regional Road 27; west on Elcho Road to LF-3C.

2. from QEW - south on Regional Road 18 (Beamsville Road); west on Regional Road 69 (Twenty Mile Road); south on Regional Road 569; south on Highway 20; south on Regional Road 27; west on Elcho Road to LF-3C.

3. from QEW - south on Regional Road 14; south on Regional Road 714; east on Regional Road 73; south on Regional Road 14; south on Regional Road 16 to LF-3C.

*4. from QEW - south on Regional Road 18 (Beamsville Road); west on Regional Road 69; south on Highway 20; south on Regional Road 27; west on Elcho Road to LF-3C.

*5. from QEW - south on Vineland Townline Road (Regional Road 24); west on Highway 20; west on Regional Road 65 from Bismarck; south on Smithville Road to LF-3C.

*6. from QEW - south on Vineland Townline Road (Regional Road 24); west on Highway 20; west on Regional Road 65 from Bismarck; south on Krick Road to LF-3C.

To LF-9C

**1. from QEW - south on Vineland Townline Road (Regional Road 24); west on Highway 20 to LF-9C.

2. from QEW - south on Regional Road 18; west on Regional Road 69; south on Regional Road 569; south on Highway 20 to LF-9C.

*3. from QEW - south on Regional Road 18; west on Regional Road 69; south on Highway 20; east on Highway 20 to LF-9C.

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* Options identified by the transportation consultants (M.M. Dillon) in preliminary Phase 4A.

** Selected as preferred access roads.

TABLE 3-1 - cont'd

ACCESS ROAD OPTIONS CONSIDERED IN PRELIMINARY PHASE 4A

To LF-1E

1. from QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road); south on Regional Road 98 (Montrose Road); west on Carl Road to LF-1E.

*2. from QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road); south on Morris Road to LF-1E.

*3. from QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road); south on Crowland Road to LF-1E.

*4. from QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road); south on Montrose Road; west on Young Road to LF-1E.

*5. from QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road); south on Montrose Road; west on Schisler Road (Regional Road 27) to LF-1E.

LF-2N/PI-1N
to PI-1N

**1. from 401 - south on Fourth Line; west on Britannia Road to PI-1N.

*2. from 401 - south on Fourth Line; west on Derry Road; south on Highway 25 to PI-1N.

PI-1N to LF-2N

**1. east on Britannia Road; north on Fourth Line Road; east on Highway 401; north on Highway 10 to LF-2N.

2. west on Britannia Road; north on Tremaine Road; east on Steeles Avenue; north on Highway 25; east on Highway 401; north on Highway 10 to LF-2N.

TABLE 3-1 - cont'd

ACCESS ROAD OPTIONS CONSIDERED IN PRELIMINARY PHASE 4A

LF-2N/PI-13N
to PI-13N (from north)

**1. from 401 - south on Fourth Line Road; east on Britannia Road; south on Fifth Line Road to PI-13N.

2. from 401 - south on Fourth Line Road; east on Derry Road; south on Fifth Line Road to PI-13N.

3. from 401 - south on Trafalgar Road; west on Britannia Road; south on Fifth Line Road to PI-13N.

PI-13N to LF-2N

1. north on Fifth Line Road; east on Britannia Road; north on Trafalgar Road (Regional Road 3); east on Highway 401; north on Highway 10 to LF-2N.

**2. north on Fifth Line Road; west on Britannia Road; north on Fourth Line Road; east on Highway 401; north on Highway 10 to LF-2N.

3. north on Fifth Line Road; west on Derry Road; north on Fourth Line Road; east on Highway 401; north on Highway 10 to LF-2N.

*4. north on Fifth Line Road; east on Britannia Road; north on Trafalgar Road; east on Derry Road to LF-2N.

LF-2N/PI-1N
to LF-4N

**1. from 401 - south on Fourth Line Road; west on Britannia Road to LF-4N.

*2. from 401 - south on Fourth Line; west on Derry Road; south on Highway 25; west on Britannia Road to LF-4N.

TABLE 3-2

ACCESS ROAD OPTIONS CONSIDERED IN PHASE 4A ANALYSIS

LF-3C

1. from QEW - south on Vineland Townline Road (Regional Road 24); west on Highway 20; south on Regional Road 27; west on Elcho Road to LF-3C.

*2. from QEW - south on Vineland Townline Road (Regional Road 24); west on Highway 20; west on Regional Road 65 from Bismarck; south on Krick Road to LF-3C.

LF-1E

1. from QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road); south on Regional Road 98 (Montrose Road); west on Carl Road to LF-1E.

2. from QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road); south on Crowland Road to LF-1E.

3. from QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road); south on Montrose Road; west on Young Road to LF-1E.

4. from QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road); south on Montrose Road; west on Schisler Road (Regional Road 27) to LF-1E.

*5. from QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road); south on Crowland Road; west on Carl Road to LF-1E.

6. from QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road); south on Montrose Road; west on Carl Road; south on Crowland Road to LF-1E.

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*Selected as preferred access roads.

NOTE: Options 3 and 4 to LF-1E were eliminated after the refinement of site boundaries and Option 2 from PI-1N to LF-4N was added.

TABLE 3-2 - cont'd

ACCESS ROAD OPTIONS CONSIDERED IN PHASE 4A ANALYSIS

LF-4N/PI-1N
PI-1N to LF-4N

1. north on Highway 25 (Bronte Road); west on Britannia Road to LF-4N.

*2. north on First Line Road; west on Britannia Road to LF-4N.

PI-27E

*1. from QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road) to PI-27E.

2. from QEW - west on Regional Road 47; north on Regional Road 98 to PI-27E.

PI-27E to LF-1E

. same as LF-1E integrated.

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*Selected as preferred access roads.

TABLE 3-3

PREFERRED ACCESS ROAD OPTIONS SELECTED IN PHASE 3B*

LF-4N

1. from QEW - north to Highway 25 (Bronte Road); west on Britannia Road to LF-4N.

LF-2N

1. from 401 - north on Highway 10 to LF-2N.

2. from 410 - west on Derry Road West to LF-2N.

PI-1N

1. from QEW - north on Highway 25 (Bronte Road) to PI-1N.

PI-13N

1. from QEW - north on Highway 25 (Bronte Road); east on Britannia Road; south on Fifth Line Road to PI-13N.

PI-13N to LF-4N

1. north on Fifth Line Road; west on Britannia Road to LF-4N.

---

* These are the preferred options used in the comparison of siting options.

FRAMEWORK AND ASSUMPTIONS

An impact matrix was employed at both stages of analysis to identify options with the lowest potential for impacts. The comparison of options was relative to each site. Since the preferred roads selected in Phase 3B were included in the comparison of siting options (Chapter 6) the detailed data collection undertaken in the second stage included these roads.

Assumptions used in the access road analysis were as follows:

- All access roads will be upgraded to provincial standards. In certain cases this would entail some loss of farm land.
- There will be no on-site agricultural activity. Thus characteristics of existing on-site operations that are adjacent to access routes are not considered in the analysis.
- Facility traffic is assumed to occur exclusively during daylight hours when farm related traffic is also greatest.
- Contaminants released as a result of an accident and spill would not affect crops and livestock beyond an 800 metre band on either side of the road.
- Mitigation is feasible for some of the impacts involving interference with O.W.M.C. truck traffic (e.g. cattle crossings).

PRELIMINARY PHASE 4A ANALYSIS

IDENTIFICATION OF FACTORS

The access road options were compared primarily on the basis of Phase 3B factors. For local roads they included length of route, the number of active farm complexes and the soil capability (Class 1 equivalents) of any lands lost due to road widening. For regional and provincial standard

roads they included length, the number of active farm complexes, and the value of sensitive crops. A new factor, the number of farm complexes with livestock replaced the livestock population factor used for both local and regional roads in Phase 3B. This factor provides more specific information on the location of livestock along the access roads. The rationale for the factors selected is outlined in Table 3-4. More detailed descriptions are in the Phase 3B agricultural report.

DATA COLLECTION AND ANALYSIS

Data collection methods are summarized below. Details are outlined in the Phase 3B Agricultural report (pages 105-109).

Length of Routes - measured on 1:10,000 NTS Base Maps.

Number of Active Farm Complexes - windshield survey of farm buildings adjacent to the roads.

Number of Farm Complexes with Livestock - windshield survey of farm buildings adjacent to the roads.

Sensitive Crops - estimated within a 2 km band centred on the access road on the basis of the 1981 Census of Agriculture Statistics (E.A.) and average dollar value (available from the Agricultural Statistics for Ontario Publication 20, O.M.A.F. [1978-1982]).

Soil Capability - length of each CLI soil capability class measured on 1:50,000 scale soil capability maps; classes converted to Class 1 equivalents (see Appendix C for methodology).

TABLE 3-4

RATIONALE FOR SELECTION OF FACTORS

FACTORS	UNITS	RATIONALE
. Length	km	- a general indicator of the potential for conflict with farming machinery/equipment moving along the roads. Short roads are preferred.
. Active farm complexes	number	- indicates the degree of potential conflict between farming activities and farm families living along the roads. - roads with the fewest number of active farm complexes are preferred.
. Farm complexes with livestock	number	- indicates the livestock along access roads that are at risk due to accidental spills of untreated toxic materials.
. Sensitive crops	dollar	- measures the relative risk to sensitive crops in the event of a spill of untreated toxic materials.
. Soil capability (Class 1 equivalents)	hectares	- indicates the degree to which land resources may be lost if local roads are widened.

At the time of data collection, the entrance points to the sites had not been established. Consequently, data were collected to the furthest point along the access roads. The data were assembled in a data matrix (Table E-1, Appendix E) for each access road option.

RANKING AND AGGREGATION

The units of measurement of the factors do not lend themselves to comparison of impacts across factors. For example, it would be very difficult to establish the importance of the number of active farm complexes relative to the value of sensitive crops. Hence, it was necessary to establish a procedure which would facilitate inter-factor comparisons. This was undertaken in the following steps:

1. scaling of the data
2. establishment of ranking representing the relative importance of the factors
3. calculation of a total score for all factors
4. a subjective assessment of scores and selection of a preferred option

Scaling

The data on the impact matrix were scaled to represent the relative distribution of potential impacts across the options. The values were transformed from absolute numbers to an index ranging from 0 to 100. For each indicator, the largest values was assigned an index of 100, and all others were taken as a percentage of this maximum value (Table E-2, Appendix E).

Ranking

Each factor was assigned a rank which represents its importance in the comparison of options and provides a means of aggregating the factors.

Rankings of 1, 2 or 3 were used with 3 being the most important. The rankings and their rationale are outlined in Table 3-5.

Scoring

A score was calculated for each factor by multiplying the scale value by the factor rank. The factor scores were summed for each option, and the options ranked in order of preference from the lowest to the highest overall impact. Where more than one route had the same score, they were given an equal ranking.

RESULTS

The results of the factor scoring are shown on Table E-2, Appendix E. The reasons for the selection of the preferred routes from an agricultural point of view are summarized below:

PREFERRED OPTION		REASONS FOR SELECTION OF PREFERRED OPTION
LF-3C	- Option 3	- lowest score because there are no local roads - lowest value of sensitive crops
to LF-9C	- Option 1	- fewest active farm complexes and farms with livestock - lowest value of sensitive crops
to LF-1E	- Option 4	- short local road - no active farms or farms with livestock on regional roads
to PI-1N	- Option 2	- lower score because there are no local roads
PI-1N to LF-2N	- Option 2	- lower score because there are no local roads
to PI-13N (from 401)	- Option 2	- few active farms and farms with livestock on local and regional roads - relatively low sensitive crop value

TABLE 3-5

RATIONALE FOR RANKING OF FACTORS

FACTOR	RANK	RATIONALE
Local Roads		
. length	3*	- users of local roads are not accustomed to high traffic volumes - potentially high conflict with farming activities
. active farm complexes	3	- provides a direct measure of the number of potentially impacted operators
. farm complexes with livestock	3	- provides an indirect measure of the livestock and poultry at risk due to accidental spills
. Class 1 equivalents	1	- only a small amount of land would be required for road widening
Regional Roads		
. active farm complexes	3	- provides a direct measure of the number of potentially impacted operators
. sensitive crops	3	- indicates relative risk to crops
. farm complexes with livestock	3	- provides an indirect measure of the livestock and poultry at risk due to accidental spills
. length	1	- the degree of conflict with farming activities will be lower on regional roads because already there are higher traffic volumes

*A rank of 3 indicates the least, and 1 the most important factor.

PREFERRED OPTION	REASONS FOR SELECTION OF PREFERRED OPTION
PI-13N to LF-2N - Option 3	- relatively few active farms and farms with livestock on local roads, and the lowest on regional roads - low sensitive crop value
to LF-4N - Option 2	- lower score because there are no local roads

PHASE 4A ANALYSIS

The second stage of analysis was undertaken to (1) select preferred access roads to LF-3C, LF-1E and PI-27E and between LF-1E and PI-27E and PI-1N and LF-4N and (2) obtain detailed information for use in the comparative evaluation of siting options for all preferred access roads.

IDENTIFICATION OF FACTORS

Disruption to farm operations will occur to farms along the O.W.M.C. access routes as a result of road widenings, higher levels of O.W.M.C.-related traffic, especially truck traffic, and the risk of accident and subsequent environmental contamination by spills of hazardous wastes.

Concerns about these factors were raised by local farmers during meetings with Ecologistics Limited and in briefs to O.W.M.C. (see the Elcho Site Study Committee of the Chippawa Watershed Association, August 1, 1984, and the Schram Site Study of the West Lincoln Task Force Against Toxic Waste, October 1, 1984).

The factors considered for use in the Phase 4A analysis are summarized in Table 3-6. As noted later, four of these were screened out.

TABLE 3-6

FACTORS CONSIDERED IN THE PHASE 4A ANALYSIS OF ACCESS ROAD OPTIONS

FACTORS	UNITS	RATIONALE
Loss of land (Class 1 equivalents)	hectares	- loss of land due to road widening has a direct impact on farm productivity
Farm machinery movements	km/yr along access roads	- indicates the potential for interference with farm traffic
Number of customer stops	stops/year	- farm operations involved in retail sales (e.g. fruit stands) may be adversely affected if increased truck traffic interferes with customer traffic
Number of service vehicle stops	stops/year	- service vehicles such as feed, milk and livestock trucks may be hampered while accessing farms
Area of crops within 800 metres	hectares	- indicates the crops at risk due to accidents or spills
Area of tillable land accessed by the roads	hectares	- a proxy measure of farm vehicles involved in field crop operations
Livestock housed (livestock and poultry)	number of animal units	- indicates the number of housed livestock at risk due to accident spills
Livestock pastured	number	- a second measure of livestock at risk
Cattle crossings	number of herd crossings/ year	- truck traffic will impede any herd movements across access roads
Number of farms with headquarters	number	- indicates farm operations where day-to-day activities will be affected
Number of farm parcels (no headquarters)	number	- a general indicator of the farm resources that may be affected

DATA COLLECTION AND ANALYSIS

Data for the access road factors were collected from two primary sources: (1) interviews with farm operators whose properties abut the access roads, and (2) surveys by road and air of crops within 800 metres of either side of the roads. Details of the data collection procedures are described in Section 3.0 of Appendix B. Results of the analysis are assembled on a data matrix for each option (Table E-3, Appendix E). Included on the tables are data for all preferred access roads identified in previous stages.

EXISTING ENVIRONMENT

This section describes the characteristics of farm operations adjacent to the access road options.

LF-3C

Both access road options to LF-3C share sections of two regional or provincial standard roads; Vineland Road from the QEW south to Highway 20 and part of Highway 20 from Vineland Road west to Bismark Road.

The north section of Vineland Road, below the Niagara Escarpment runs through orchards and vineyards, and the Town of Vineland. There are several pick your own operations and roadside fruit and vegetable stands. South of the escarpment, there is a mix of cash crop, dairy and poultry farms. Approximately half of the parcels are farmed by owner-operators with headquarters on the properties. The remaining are farmed by local cash crop operators who use the road periodically to move equipment.

A number of poultry and dairy operations are situated along Highway 20, between Vineland Road and Regional Road 27. Local cash croppers rent land in the area. There is frequent farm-related traffic (farm machinery and service vehicles) along this stretch of the road during the year.

Option 1 extends south from Highway 20 on Regional Road 27, then west on Elcho Road (local). Both of these roads are bordered by dairy, beef, cash crop and mixed farms. There is a relatively high density of farms on Elcho Road. Unoccupied parcels are either part of a locally-owned operation, or farmed by a local tenant. Consequently, there is a large number of farm vehicles travelling along the roads between these properties. Approximately 25% of all kilometers of farm machinery traffic reported for this option occurs on this short section of Elcho Road.

Option 2, from Highway 20 at Bismark west along Regional Road 65 and south on Krick Road (local) passes dairy and poultry farms. Most of the properties along Regional Road 65 are occupied by farmers while the land along Krick Road is owned by one large family-operated dairy farm. Cattle are moved between fields along Krick Road daily during the growing season. Some farmers operate land on both Regional Road 65 and Krick Road. Approximately 30% of all kilometers of farm vehicle movements reported for Option 2 occur along these two roads.

To LF-1E

Options 1, 2, 5 and 6 are described here. Options 3 and 4 were eliminated when the site boundaries of the LF-1E Phase 3B acquisition area were refined (Chapter 2).

All options share a section of Biggar Road between the QEW and Montrose Road. None of the land along this short section (.8 km) is farmed.

Of the roads in Option 1, almost all of the farming activity takes place along Carl Road. Here, there are two beef, two mixed, and one horse farm and some cash cropping by local farmers. Seventy-five percent of the farm vehicle traffic for Option 1 occurs on Carl Road. There is one mixed farm along Regional Road 98 and much of the land is in non-farm uses.

Land adjacent to Option 2 (Regional Road 47 and Crowland Avenue) is mainly cash cropped by local farmers. Crowland Avenue is used to move machinery between the fields.

Option 5 shares the same route as Option 2 along Regional Road 47 and Crowland, but extends west on Carl Road to a proposed entrance. There are some cropped fields along this short section of the road.

Option 6 shares the same route as Option 1 except that the proposed entrance would be on Crowland Avenue. There is one cash crop farmer along this section of Crowland Avenue.

PI-1N to LF-4N

Option 1 runs north along Bronte Road, a provincial highway (25), then west along Britannia Road to LF-4N. There are two beef, two cash crop and one slaughter house along this section of Bronte Road. Farm-related traffic for these and other local farmers is relatively high.

Most of the land along this section of Britannia Road is cash cropped and there is frequent farm equipment movement. Although Brittania Road is a regional road, its condition is not up to regional standards. Consequently, frequent use is made by operators to avoid traffic on more heavily travelled roads.

Option 2 runs north from PI-1N along First Line Road and west on Brittania Road to LF-4N. This section of First Line Road is relatively quiet, with one horse farm and some cropped land. Most of the land adjacent to Britannia Road is cropped and there is a moderate amount of local farm-related traffic.

To PI-27E

For the partially integrated siting option LF-1E/PI-27E both access route options to PI-27E from the QEW are relatively short. Much of the adjacent land is not farmed.

PI-27E to LF-1E

The descriptions of the options are the same as to LF-1E described above.

SCREENING OF FACTORS

The factors (Table E-3) were reviewed to determine if any were superfluous either because they were duplicating the information provided by other factors or because they did not reveal any significant differences between routes. As a result of this review, the following were dropped from the analysis:

- area of tillable land
- livestock pastured
- number of farms with headquarters
- number of farm parcels (no headquarters)

The area of tillable land is quite similar to the area of cropped land. Almost all of the livestock pastured were also reported to be housed in barns. Double counting would result if both factors were retained.

The number of farms with headquarters and the number of farmed parcels are indirect measures of farming activity which could be affected on a day-to-day basis. Since direct measures of activities are being used (farm traffic, crops and livestock) these two factors are not required for the comparison of options. Consideration of the potential impact to farm families was considered in the analysis by the social impact consultants, Institute of Environmental Research Inc. (I.E.R.), 1985.

RANKING AND AGGREGATION OF FACTORS

The factors were ranked and aggregated according to the three-step precedure described in the preliminary Phase 4A analysis. The assigned rankings, and their rationale are outlined in Table 3-7. The final scaling, scores and ranking of options are shown on Table 3-8.

RESULTS

The preferred access route options which minimize agricultural impacts and the rationale for their selection are as follows:

PREFERRED OPTION		REASON FOR SELECTION OF PREFERRED OPTIONS
to LF-3C	- Option 2	- although Option 1 has a lower score, there would be more impact to farms on Elcho Road (local) than on Krick Road (local). There are no farm headquarters on Krick Road and cattle crossings can be mitigated with a tunnel.
to LF-1E	- Option 2	- low values for all factors - fewest kilometers of farm machinery movements
PI-1N to LF-4N	- Option 1	- fewest farm machinery movements, service vehicle stops and hectares of crops - no livestock and poultry
to PI-27E	- Not Selected	- no option preferred as both have minimal farming activities
PI-27E to LF-1E	- Option 2	- fewest kilometers of farm machinery movements and hectares of crops

TABLE 3-7

RATIONALE FOR RANKING OF FACTORS

FACTOR	RANK	RATIONALE
Loss of Land	3*	- high weight as this measures a direct loss of productive land
Machinery Movements	3	- the potential for disruption of vehicle movements and/or accidents with farm vehicles is high since farm vehicles are slow and often cumbersome
Cattle Crossings	3	- potential for disruption is high and quite certain
Livestock/Poultry Housed	2	- livestock are an important farm asset but the nature of the impact is not well defined at this time
Number of Service Vehicle Stops per Year	1	- these travel at full speed; disruption will only occur when vehicles approach or leave farms
Number of Customer Stop per Year	1	- these travel at full speed; disruption will only occur when vehicles approach or leave farms
Area of Crops Within 800 metres	1	- low weight since the likelihood of a release is very low (M.M. Dillon, 1985b)

*A rank of 3 denotes a high level of importance, and a rank of 1 a low level.

TABLE 3-8

PHASE 4A FACTOR SCALING AND OPTION RANKING

To LF-3C

FACTORS	FACTOR RANK	OPTION 1* SCALE	OPTION 1* SCORE**	OPTION 2 SCALE	OPTION 2 SCORE
Farm Machinery Movements (km/yr)	3	75	225	100	300
Livestock and Poultry Housed (Animal Units)	2	83	165	100	200
Cattle Crossings	3	2	6	100	300
Service Vehicle Stops	1	100	100	100	100
Customer Stops	1	100	100	100	100
Loss of Land (Class 1 Equivalents)	3	0	0	100	300
Crops Within 800 Metres	1	97	97	100	100
Option Score			693		1400
Option Rank			2		1

*For description of each option see Table 3-2.
**Score = rank x scale.

TABLE 3-8 - cont'd

PHASE 4A FACTOR SCALING AND OPTION RANKING

Option: to LF-1E

Factors	Weight	Option 1		Option 2		Option 3		Option 4	
		Scale	Score	Scale	Score	Scale	Score	Scale	Score
Farm Machinery Movements	3	100	300	52	155	55	166	96	289
Livestock and Poultry Housed (Animal Units)	2	100	200	30	60	30	60	100	200
Cattle Crossings	3	0	0	0	0	0	0	0	0
Service Vehicle Stops	1	100	100	21	21	21	21	100	100
Customer Stops	1	0	0	0	0	0	0	0	0
Loss of Land (Class 1 Equivalents)	3	0	0	0	0	0	0	0	0
Crops Within 800 Metre Band	1	78	78	100	100	94	94	70	70
Option Score			678		336		341		659
Option Rank			4		1		2		3

TABLE 3-8 - cont'd

PHASE 4A FACTOR SCALING AND OPTION RANKING

PI-1N to LF-4N

FACTORS	FACTOR RANK	OPTION 1 SCALE	OPTION 1 SCORE	OPTION 2 SCALE	OPTION 2 SCORE
Farm Machinery Movements	3	70	210	100	300
Livestock and Poultry Housed (Animal Units)	2	0	0	100	200
Cattle Crossings	3	0	0	0	0
Service Vehicle Stops	1	18	18	100	100
Customer Stops	1	0	0	0	0
Loss of Land (Class 1 Equivalents)	3	100	300	100	300
Crops Within 800 Metre Band	1	64	64	100	100
Option Score			592		1000
Option Rank			1		2

TABLE 3-8 - cont'd

PHASE 4A FACTOR SCALING AND OPTION RANKING

To PI-27E

FACTORS	FACTOR RANK	OPTION 1 SCALE	OPTION 1 SCORE	OPTION 2 SCALE	OPTION 2 SCORE
Farm Machinery Movements	3	0	0	0	0
Livestock and Poultry Housed (Animal Units)	2	0	0	0	0
Cattle Crossings	3	0	0	0	0
Service Vehicle Stops	1	0	0	0	0
Customer Stops	1	0	0	0	0
Loss of Land (Class 1 Equivalents)	3	0	0	0	0
Crops Within 800 Metres	1	97	97	100	100
Option Score			97		100
Option Rank			1		1

TABLE 3-8 - cont'd

PHASE 4A FACTOR SCALING AND OPTION RANKING

Option: PI-27E to LF-1E

Factors	Weight	Option 1 Scale	Option 1 Score	Option 2 Scale	Option 2 Score	Option 3 Scale	Option 3 Score	Option 4 Scale	Option 4 Score
Farm Machinery Movements	3	100	300	52	155	55	166	96	289
Livestock and Poultry Housed (Animal Units)	2	100	200	30	60	30	60	100	200
Cattle Crossings	3	0	0	0	0	0	0	0	0
Service Vehicle Stops	1	100	100	21	21	21	21	100	100
Customer Stops	1	0	0	0	0	0	0	0	0
Loss of Land (Class 1 Equivalents)	3	0	0	0	0	0	0	0	0
Crops Within 800 Metre Band	1	78	78	100	100	94	94	70	70
Option Score			678		336		341		659
Option Rank			4		1		2		3

CHAPTER 4

RAIL ACCESS OPTIONS

INTRODUCTION

This chapter documents the agricultural impact analysis of alternate rail access options leading from trunk rail lines to sites with physical/ chemical treatment plants. The analysis included the identification of factors and indicators, data collection and compilation mapping and tabulation of data, indicator data scaling and factor ranking and aggregation.

In the Phase 4A analysis, rail service was viewed as an opportunity for hauling process additive and re-agents to the physical chemical plants rather than a requirement of a siting option. The rejection of rail service to a site due to unacceptable costs and impacts did not result in the rejection of a site. Although rail access was not included in the detailed comparative evaluation of siting options, it is considered in the site selection report (M.M. Dillon, 1985a) to determine if the hauling of process additives and reagents by rail would alter the ranking of siting options.

FRAMEWORK AND ASSUMPTIONS

The comparison of rail options undertaken in Phase 4A consisted of two phases:

- a review of constraint maps to assist in the delineation of rail access options to the candidate sites

- an evaluation of specific rail options into LF-9C, LF-3C, LF-4N, LF-1E and PI-1N

The following assumptions provided by M.M. Dillon (1985b) guided the analysis:

- the railway will consist of a single track within an 18.3 m right-of-way
- the materials transported by rail would be relatively harmless chemical additives and reagents required in the physical chemical treatment process
- short range catastrophic events such as collision could have a direct impact within 250 m on either side of the railway track
- noise impacts may occur in a zone which extends 170 m on either side of the railway track

CONSTRAINT MAPPING

This section describes the constraint mapping which was undertaken for the identification of rail access options. The areas under consideration were broad study zones identified by M.M. Dillon (1985b) within which there is the potential to link the main rail lines with each of the relevant candidate sites.

STUDY METHODS

The factors selected for defining the agricultural constraints were: proximity to farm buildings, severance of farm parcels, and cropland. A ranking procedure was developed indicating potentially high to low constraints.

SELECTION OF FACTORS AND INDICATORS

The rationale for the selection of each factor and indicator is outlined below.

Proximity to Farm Buildings

Active farm buildings were used to indicate viable farm operations. From an agricultural perspective, rail alignments should not be in close proximity to these buildings. Noise and risk of accident could interfere with farm activities. The condition of farm buildings was used as a general indication of relative impact potential. Condition classes were: commercial farm buildings in average and above-average condition, hobby or horse farms, unused or derelict buildings.

Severance of Farm Parcels

A rail alignment may sever farm properties, creating small inefficient fields, or restricting farm machinery access to fields if crossings are not provided. Alignments that run along property lines would pose the least constraint from the point-of-view of agriculture. Indicators for this factor reflected the relative degree of constraint posed by severance of parcels of different size: >50 ha, 12-50 ha and <12 ha.

Cropland

The presence of land currently being used for crop production is an indicator of the potential for agricultural impact. From an agricultural perspective it would be best to avoid such land. Indicators for this factor were: specialty crops, other crops and land not cropped. An over-riding concern in the analysis was the specialty crops. If any occurred within a corridor, it was recommended that the area be avoided.

DATA COLLECTION

Farm Buildings

At the time of the constraint mapping the Phase 4A the data from interviews with site and vicinity farm operators were not yet compiled. Consequently, data on farm building complexes identified in the Phase 3B initial comparative evaluation phase were used. The location of farm building complexes and their identification codes were transferred from the 1:10,000 Agricultural Land Use Maps* to the working maps (1:10,000).

The codes are:

A above-average commercial farm building

B average commercial farm building

C hobby or horse farm

D unused or derelict

In the case of PI-13N, LF-2N and LF-9C, where the rail corridors extended beyond the areas covered by the Phase 3B maps, a windshield inspection was undertaken to establish the location of farm buildings within the corridor on a 1:10,000 scale map, and assign identification codes.

Severance of Farm Properties

The boundaries of land parcels were obtained from the Ministry of Revenue assessment roll maps (1:5,000) and marked on the 1:10,000 working maps.

Cropland

The areas of general field crops and specialty crops were obtained from the crops and livestock population maps which were compiled for the

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*Maps E.A18, E.A19, E.A20, E.A21, E.A27, E.A29, E.A30, E.A31, and E.A34 in SITE SELECTION PROCESS PHASE 3B: SELECTION OF CANDIDATE SITES - Agriculture, October 31, 1984.

comparison of siting options (1:10,000), and marked on the 1:10,000 working maps.

General field crops include: small grains, row crops and hay. Specialty crops mapped were fruits, vegetables and berries, nurseries and sod.

RANKING OF FACTORS AND INDICATORS

Ranking of Indicators

Relative impact ratings were assigned to the indicators based on the following criteria:

FACTORS	INDICATORS	RELATIVE IMPACT LEVEL
Farm Buildings	- commercial farm buildings in average and above-average condition	- high impact
	- hobby or horse farm	- moderate impact
	- below average farm buildings (unused or derelict)	- low impact
Severance of Farm Properties	- >50 ha	- high
	- 12 - 50 ha	- moderate
	- <12 ha	- low
Cropland	- specialty crops	- very high
	- other crops	- moderate
	- not cropped	- low

Ranking of Factors

The factors were considered to differ in their degrees of importance. The following reflects the relative levels of importance assigned to the factors in the constraint mapping stage:

. Farm Buildings	3
. Severance of Farm Properties	2
. Cropland	1

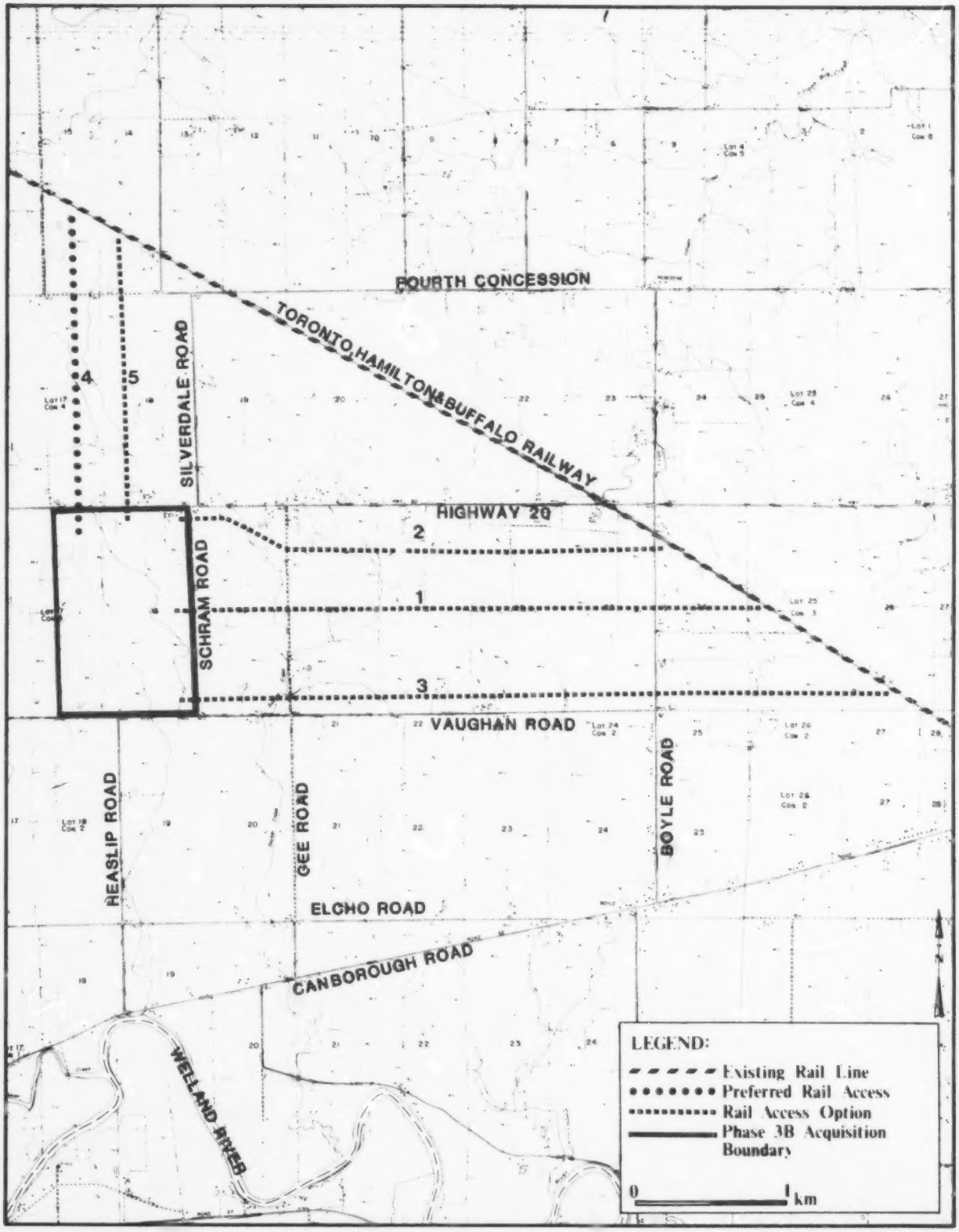
RESULTS

Rail options into each site were identified on the basis of a constraint mapping analysis by the site selection team.

Rail access to PI-13N and LF-2N was dropped from consideration at the constraint mapping stage by the site selection team because of major constraints (impacts and costs). It was assumed that rail service was not considered as an opportunity at these two sites. Potential rail access options were identified for the remaining sites. Refer to the M.M. Dillon (1985a) report for details of the constraint mapping analysis.

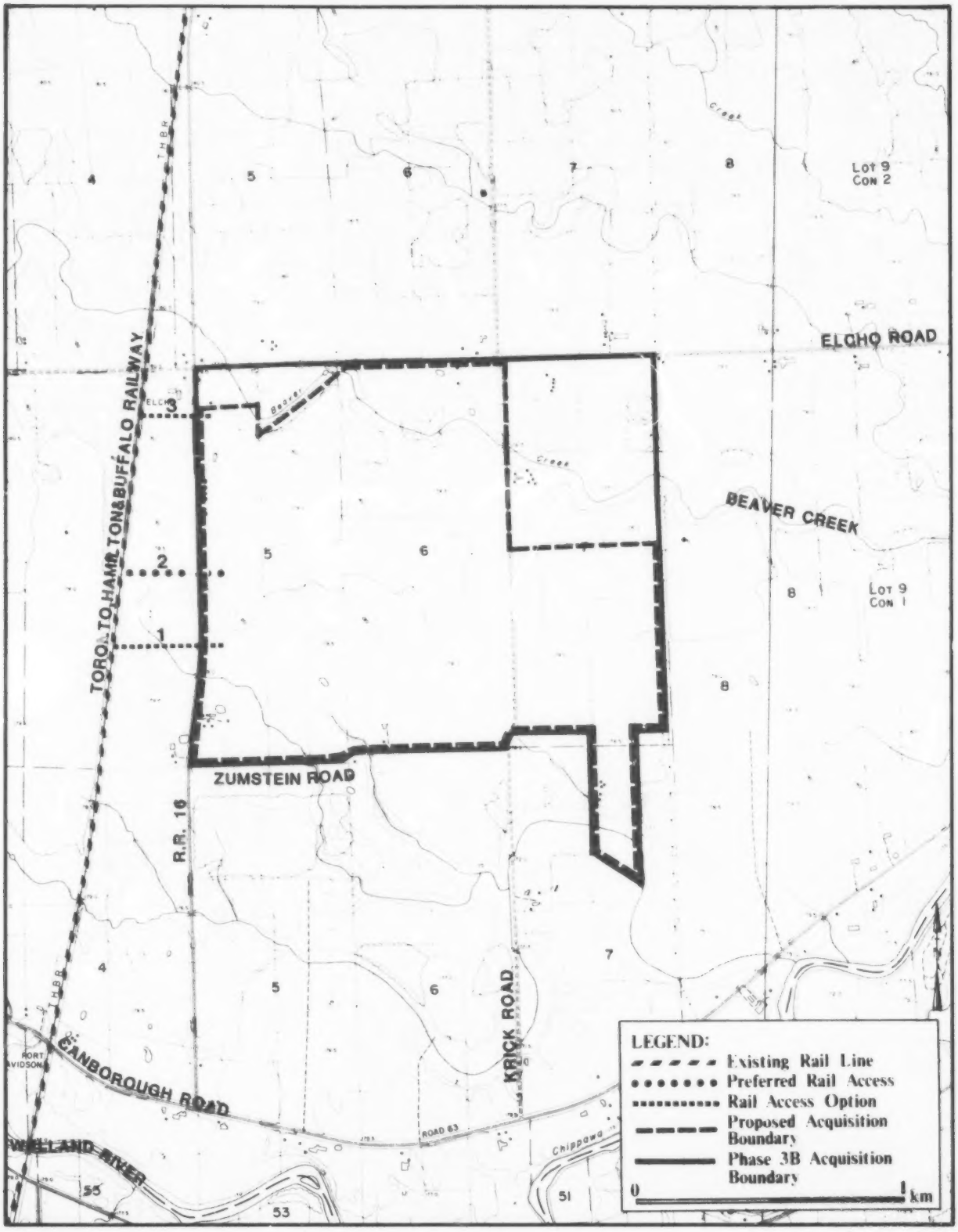
COMPARATIVE EVALUATION OF RAIL ACCESS OPTIONS

The evaluation of rail options was undertaken for LF-9C, LF-3C, LF-4N, LF-1E and PI-1N. The rail access options for these sites are shown in Figures 4-1 to 4-5. The options to PI-27E were not considered in the comparative evaluation as the proposed alignments were within the site acquisition boundaries (Figure 4-6).

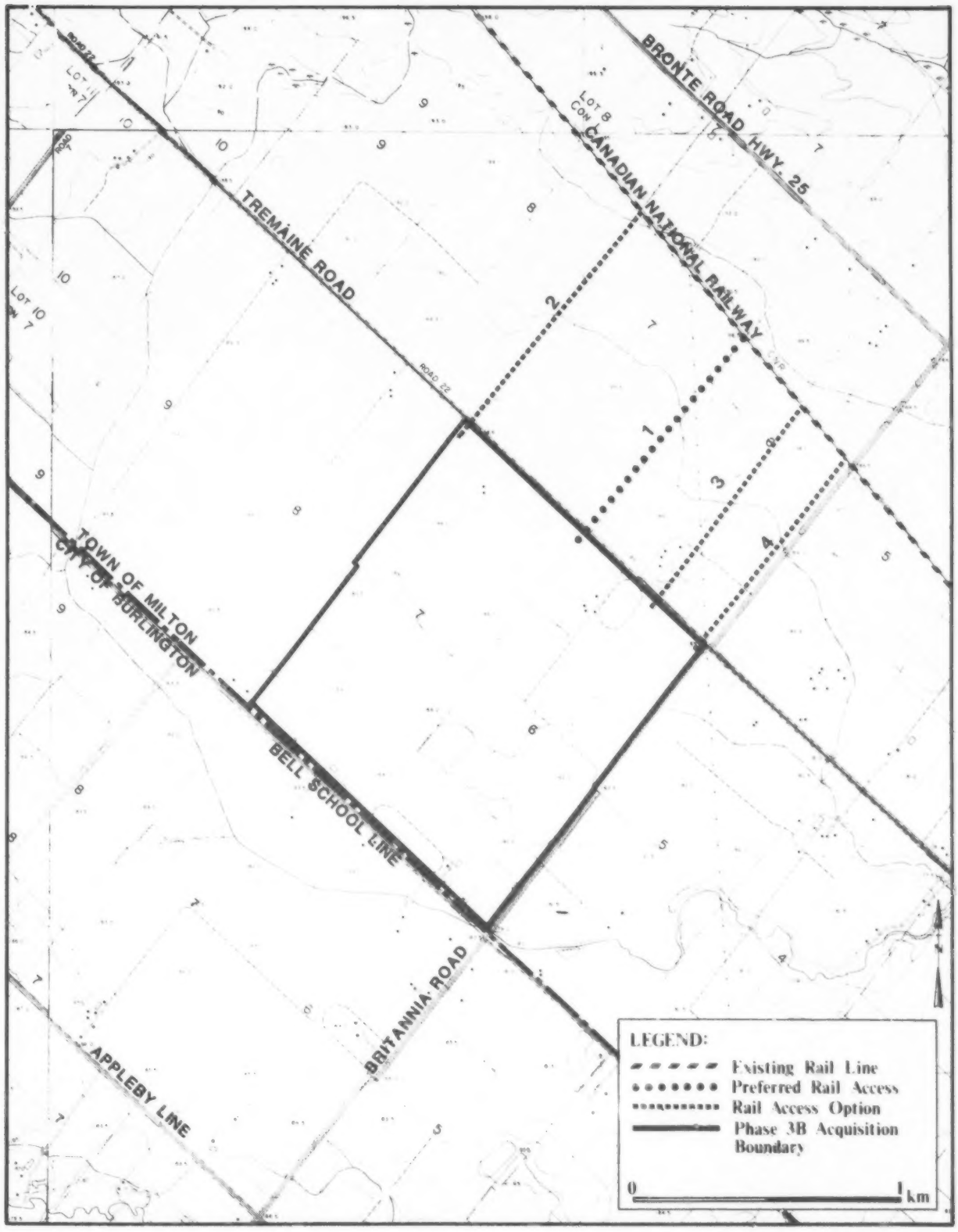


LF-9C
RAIL ACCESS

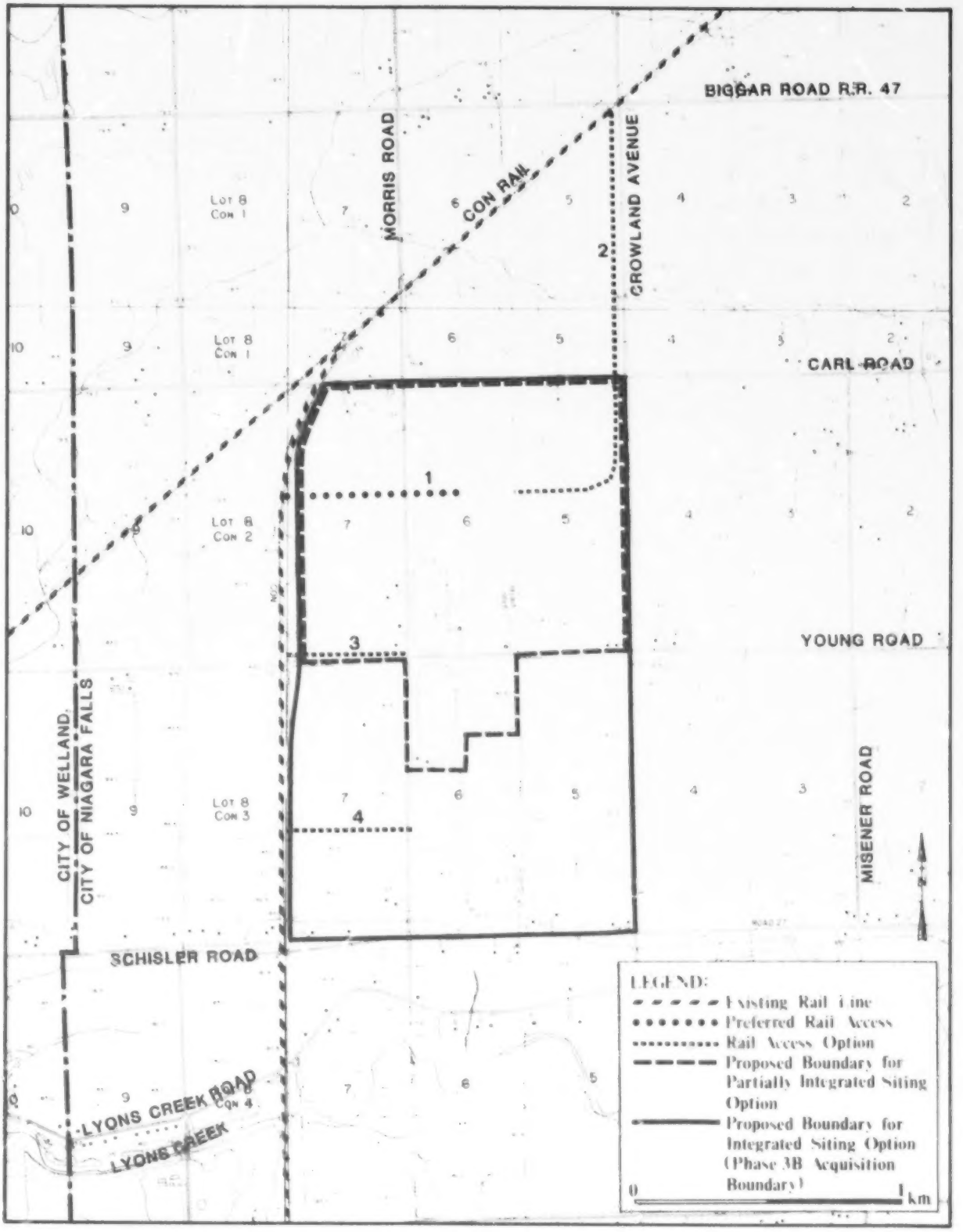
FIGURE 4-1



LF-3C
RAIL ACCESS
FIGURE 4-2

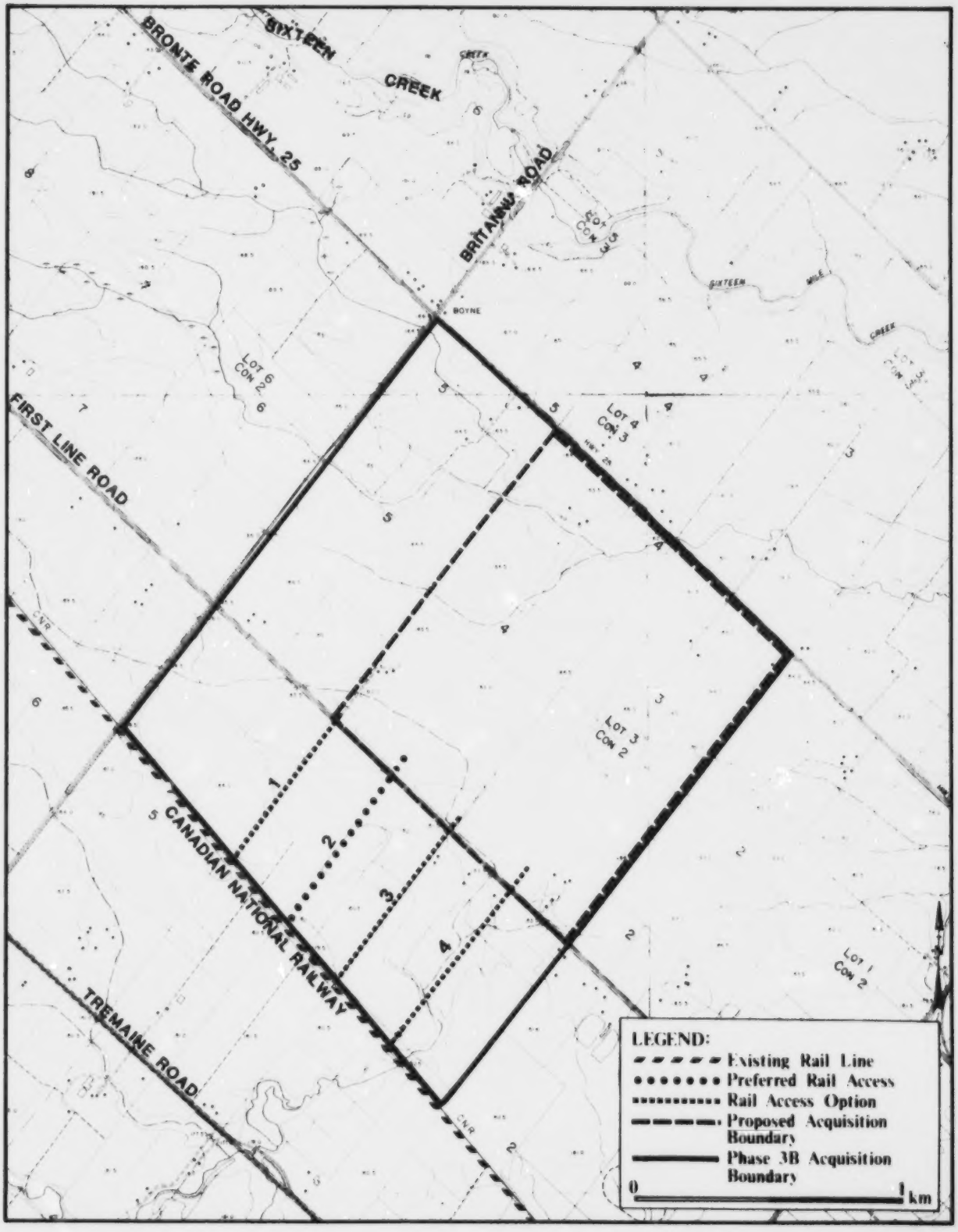


LF-4N
RAIL ACCESS
FIGURE 4-3



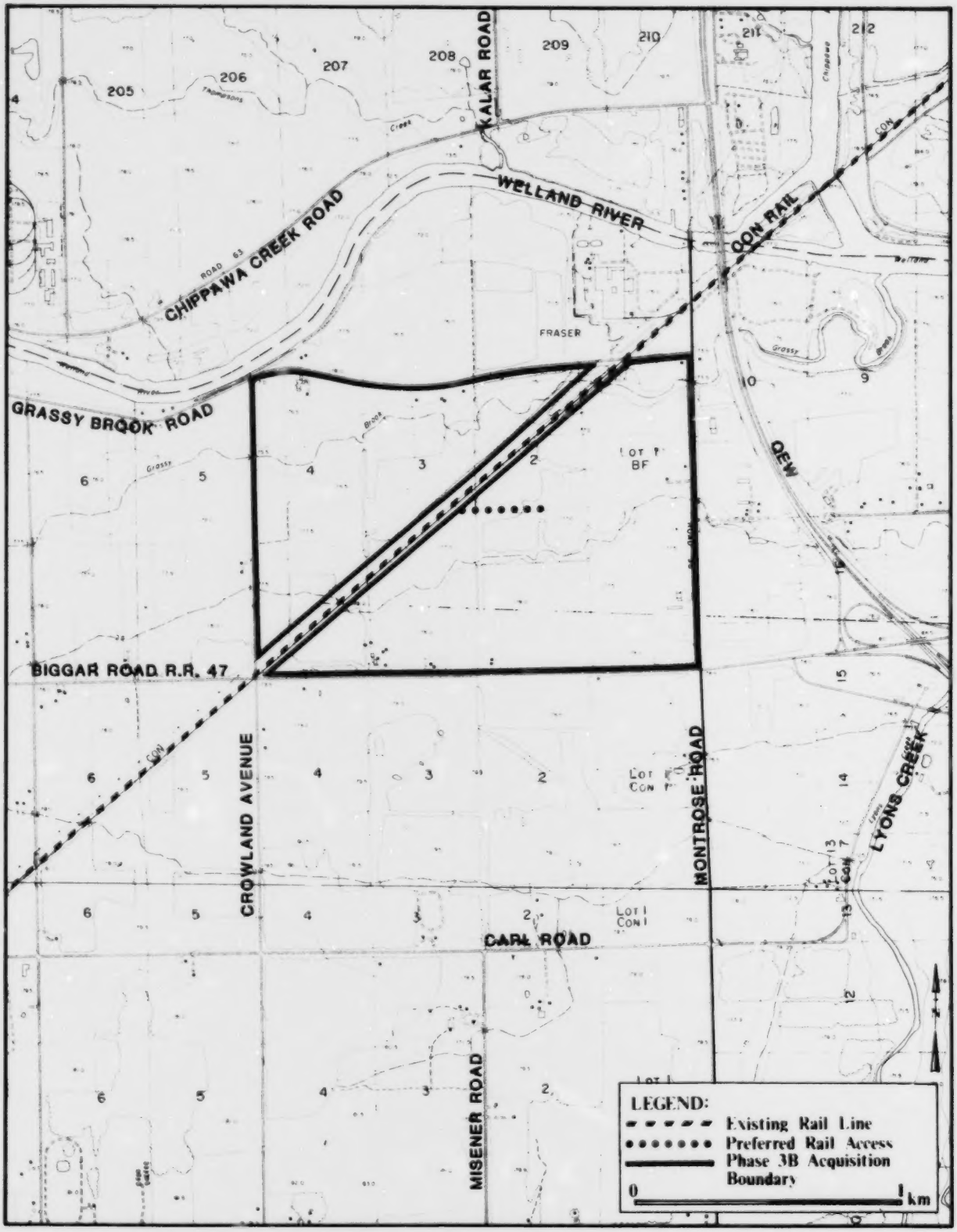
LF-1E
RAIL ACCESS

FIGURE 4-4



PI-1N
RAIL ACCESS

FIGURE 4-5



PI-27E
RAIL ACCESS

FIGURE 4-6

IDENTIFICATION OF FACTORS

The factors selected for the comparative evaluation of the rail options were as follows:

- loss of farmland (Class 1 equivalents)
- severance of farm parcels
- proximity to farm buildings
- amount of cropland affected

The rationale for the selection of each factor is outlined below.

Loss of Farmland

Construction of the rail spur line will result in the direct transfer of land available for agricultural production to non-agricultural uses. The amount of productive land lost from the agricultural land base was described using Canada Land Inventory Class 1 equivalent area measurements. This allows for a direct comparison of land requirements among rail options (see Appendix C, Section 2.0 for a discussion of the methodology). The smaller the area of Class 1 equivalent land, the lower the potential for agricultural production. Impacts due to the transfer of land to non-agricultural uses will be less for options with the lowest Class 1 equivalent rating.

Severance of Farm Parcels

The rail right-of-way may sever farm properties. This could create small fields which are inefficient to farm with existing machinery or it may restrict machinery access to fields if crossings are not provided. Routes with the fewest number of severances are preferred.

Proximity of Farm Buildings

The number of barns adjacent to the rail line indicates the potential for disruption to livestock. Since it was not possible to confirm through roadside surveys the type, number and duration of livestock housing, it was assumed that all actively used barns were used routinely for livestock housing purposes.

A noise impact zone 170 m on either side of the railroad tracks was determined in consultation with the transportation consultant, M.M. Dillon, and the site selection team. This is contained within a 250 m zone on both sides of the railroad tracks where there could be direct effects from a catastrophic event (M.M. Dillon, 1985b). The number of farm buildings within 250 m on either side of the tracks was used to indicate the direct impacts of the rail access to farming. Routes with the fewest number of farm buildings within this zone are preferred. Farm residences are addressed in the social analysis report of I.E.R. (1985).

Cropland Affected

This indicator provides a measure of the relative risk to standing crops due to rail accidents and/or spills of materials while in transit. These events could result in the destruction or contamination of crops. Potential impacts are greater for routes with a large amount of cropland than for routes with more idle and non-agricultural land.

DATA COLLECTION AND ANALYSIS

This section describes the data sources and the procedures used for data collection and compilation. The data sources were largely those used in the site and vicinity analysis (Chapter 6). Any additional data required outside the vicinity were collected by roadside investigations and from secondary sources compiled at the constraint mapping stage of analysis.

Class 1 Equivalents (Hectares)

Soil capability information was obtained from the Canada Land Inventory capability mapping prepared for the Phase 4A vicinity analysis (Appendix C). The area of each capability class within an 18.3 m band centred on the rail option, was measured on a 1:20,000 scale map. The total area of each class was multiplied by the relevant soil productivity indices and summed for each option following the procedure outlined in Appendix C.

Severance of Farm Parcels

The boundaries of farmed parcels were obtained from the "Size, Use and Tenure of Land Parcels" maps (1:10,000) prepared for the detailed comparative evaluation of siting options (Maps 17 to 24 in Site Selection Process Phase 4A: Selection of a Preferred Site(s) - Agriculture. Technical Data Map Portfolio). At LF-9C, the alignment of Options 1, 2 and 3 extends beyond the study area covered by the maps. Here, data prepared at the constraint mapping stage of the rail options analysis were utilized.

The boundaries of farmed parcels were plotted on 1:10,000 scale maps. Each rail option was assigned a low, medium or high rating representing the degree of impact on farms. These categories were based on the number of severances and a subjective assessment of the potential severity of the severance.

Proximity to Farm Buildings

The farm building complexes which are actively used for farming were identified from the the 1:10,000 scale crop and livestock Maps 9 to 16 (Site Selection Process Phase 4A: Selection of a Preferred Site(s) - Agriculture. Technical Data Map Portfolio) prepared for the detailed comparative evaluation of siting options. A band 500 m wide and centred

on the rail alignment was overlaid on the maps. The actively used farm building complexes located within the impact zone were counted. At LF-9C, where three options extend beyond the areas covered by the data maps, the 500 m band was overlaid on the constraint maps prepared for the preliminary stage of this analysis using Phase 3B data. The number of actively used farm building complexes were added to the total.

Cropland

The area of cropland was obtained from the Crop and Livestock Maps 9 to 16 (1:10,000) (Site Selection Process Phase 4A: Selection of a Preferred Site(s) - Agriculture. Technical Data Map Portfolio). A 500 m band, centred on the rail alignment was overlaid on these maps. The area of crops in 1984 within the band was determined. Cropland includes the following crop categories: small grains, row crops, fruits, vegetables and berries, and nurseries and sod. The Land Use Systems Mapping prepared by O.M.A.F. (see discussion in Appendix B, Section 4.3) was used for LF-9C where the rail access extended beyond the site vicinity study area.

The results of the data collection and compilation are outlined in Table 4-1.

EXISTING ENVIRONMENT

The environments that would be impacted by the rail access options are described below.

LF-9C

Options 1, 2 and 3 extend for about 5 km through an actively farmed area. Cropland contains a mix of corn, grain and hay with some pasture. There are several large woodlots within the area.

TABLE 4-1

INDICATOR VALUES FOR RAIL ACCESS OPTIONS

Options		Loss of Farmland, (ha of Class 1 equivalents)	Severance of Farm Parcels	Proximity to Farm Buildings (number of farm building complexes)	Cropland Affected (ha)
LF-9C	1	3.0	low	1	243
	2	2.5	high	5	245
	3	3.3	high	6	265
	4	1.5	low	1	129
	5	1.4	low	1	98
LF-3C	1	.16	high	0	13
	2	.24	0	0	15
	3	.24	moderate	2	5
LF-4N	1	1.0	0	1	50
	2	.8	0	0	48
	3	.8	0	0	44
	4	.8	low	0	41
LF-1E	1	N/A*	N/A	N/A	N/A
	2	.7	low	0	65
	3	.8*	0	1	31
	4	N/A*	N/A	N/A	N/A
PI-1N	1	1.2	0	1	60
	2	.5	0	0	24
	3	.6	0	0	10
	4	.6	0	1	14

*Alignment is within the site acquisition area.

Option 1 runs down the middle of a concession, through several woodlots at the back of farms. Class 2 soils predominate along the route. Option 2, located just south of five sets of farm buildings, would sever the buildings from back fields. This option would displace Class 2 and 3 soils. Option 3, which is immediately north of Vaughn Road East, is the longest route. It also affects the largest amount of cropland though soils are predominately Class 3 and 4. Six sets of farm buildings would be within 250 m of this route.

The fourth and fifth options extend to the north through a less intensively farmed area. Hay and pasture are more prevalent along these routes and soils are largely Classes 3 and 4. Moreover, affected properties tend to be smaller. Option 4 is aligned along property lines and, therefore, no severance would occur. Adjacent crops are hay and corn. Option 5 severs one parcel and may displace a set of farm buildings. Adjacent crops include hay, corn and oats.

LF-3C

The corridor connecting the Toronto, Hamilton and Buffalo Railroad with site LF-3C is actively farmed, mainly in row crops with some hay and pasture. Two relatively large parcels of land are in the corridor, however, the corridor is very short. Three route options run east from the main rail line to the site.

Option 1, the most southerly route, passes between two properties and does not entail a severance. Option 2, just to the north, does sever a large area of cropland. Option 3, just below Elcho Road, would pass within 250 m of one set of farm buildings.

LF-4N

Access into LF-4N is across intensively farmed land along the northeast border of the site. Cropland is devoted largely to cash crops including grain corn and small grains. Small areas of fodder corn and hay were also evident. Class 1 and 3 soils are found throughout the corridor. Four options pass through the corridor.

Routes 1, 2 and 3, to the north, all follow property lines and thus do not entail severances. Lands adjacent to Option 1 have the highest proportion of Class 1 soils. Option 4 entering the eastern corner of the site, severs a property and creates at least two relatively small fields. It also passes within 250 m of one farm building complex.

LF-1E

Of the three options for LF-1E, Option 1 passes directly into the site and the other two are in different corridors.

Option 2, the longest route, comes from the north along Crowland Road. No properties are severed since it passes between the road and the adjacent property. Adjacent lands contain Class 3 soils. Cropped areas were in hay and grain corn at the time of the field surveys.

Option 3 from the west runs a short distance along the road allowance for Young Road. It lies along the south boundary of the site and, therefore, would impact only the lands south of the alignment. These lands, containing Class 3 soils, are either idle or in low-intensity crops uses.

PI-1N

All of the rail options to PI-1N would extend from the CN rail line

easterly to the site for approximately 750 m. The area is subdivided into small parcels which are not intensively farmed. Hay and pasture are the main uses, some winter wheat is currently grown to the south of Option 4. All of the soils immediately east of the site are capability Classes 1 and 3.

All of the options are aligned along property boundaries, and therefore, will not subdivide any parcels. One set of farm buildings is within 250 m of Option 4.

RANKING AND AGGREGATION

This section outlines the procedure undertaken to scale the data, aggregate the factors and rank the options.

Scaling of the Data

The data on Table 4-1 were transformed from absolute numbers to an index ranging from 0 to 100. The indicator with the highest value was given an index of 100 and all other values were established relative to that value (Table 4-2). The ratings representing the severance of farm parcels were scaled as follows:

- high - 100
- moderate - 66
- low - 33

Factor Ranking

Each factor was assigned a rank which indicates its relative importance in the comparison of options and provides a means of aggregating the factors. The ranking and their rationale are outlined in Table 4-3.

Factor Aggregation

A factor score was calculated for each indicator according to the following formula: FACTOR SCORE = SCALE VALUE x INDICATOR WEIGHT. The factor scores were summed for each option. Options were then compared on the basis of total scores and ranked in order of relative overall impact.

RESULTS

The results of this analysis are shown in Table 4-2. The reasons for the selection of the preferred options from an agricultural perspective are outlined below.

LF-9C - Option 4

As shown on Table 4-2, the values for all Option 4 indicators are low. Although Option 5 has a lower score, it would displace one set of farm buildings and is thus less preferred.

LF-3C - Option 2

No farm parcels are severed, and there are no farm building complexes in proximity of the option.

LF-4N - Options 2 and 3

No farm parcels are severed and there are no complexes close to the route. There are low amounts of agricultural land displaced, and similar amounts of cropped land affected.

TABLE 4-2

COMPARATIVE EVALUATION OF OPTIONS

Factors	Weight	Option 1		Option 2		Option 3		Option 4		Option 5	
		Scale	Score	Scale	Score	Scale	Score	Scale	Score	Scale	Score
Option: LF-9C											
Loss of Farmland	3	91	273	76	228	100	300	45	135	42	126
Severance of Farm Parcels	3	33	99	100	300	100	300	33	99	33	99
Proximity to Farm Buildings	2	17	34	83	166	100	200	17	34	17	34
Cropped Land Affected	1	92	92	92	92	100	100	49	49	37	37
OPTION SCORE			497		787		900		318		297
OPTION RANK			3		4		5		1		2*
Option: LF-3C											
Loss of Farmland	3	67	201	100	300	100	300				
Severance of Farm Parcels	3	100	300	0	0	66	198				
Proximity to Farm Buildings	2	0	0	0	0	100	200				
Cropped Land Affected	1	87	87	100	100	33	33				
OPTION SCORE			588		400		731				
OPTION RANK			2		1		3				
OPTION: LF-4N											
Loss of Farmland	3	100	300	80	240	80	240	80	240		
Severance of Farm Parcels	3	0	0	0	0	0	0	33	99		
Proximity to Farm Buildings	2	100	200	0	0	0	0	0	0		
Cropped Land Affected	1	100	100	96	96	88	88	82	82		
OPTION SCORE			600		336		328		421		
OPTION RANK			3		1		1		2		
Option: LF-1E											
Loss of Farmland	3	within		87	261	100	300	within			
Severance of Farm Parcles	3	site		33	99	0	0	site			
Proximity to Farm Buildings	2	acquisition		0	0	100	200	acquisition			
Cropped Land Affected	1	area		100	100	48	48	area			
OPTION SCORE					461		548				
OPTION RANK			1		2		3		1		
OPTION: PI-1N											
Loss of Farmland	3	100	300	42	126	50	150	50	150		
Severance of Farm Parcels	3	0	0	0	0	0	0	0	0		
Proximity to Farm Buildings	2	100	200	0	0	0	0	100	200		
Cropped Land Affected	1	100	100	40	40	17	17	23	23		
OPTION SCORE			600		166		167		373		
OPTION RANK			4		1		1		3		

* displaces a set of farm buildings.

TABLE 4-3

RAIL ACCESS ANALYSIS
RATIONALE FOR RANKING OF FACTORS

FACTOR	RANK	RATIONALE FOR RANKING
Loss of Farmland	3*	- a direct transfer of land to non-agricultural uses - cannot be recovered
Severance of Farm Parcels	3	- an ongoing disruption to farm activities - potential creation of small fields which are inefficient to operate and difficult access to fields
Proximity to Farm Buildings	2	- potential risk to farm people, livestock and structures which are adjacent to the railroad
Cropland Affected	1	- a relatively short-term impact to standing crops - can more readily compensate for loss or impact than for other indicators

*Level 3 denotes a high ranking, and level 1 a low ranking.

LF-1E - Options 1 and 4

Both options are located in the site acquisition area and, therefore, would not affect off-site agriculture.

PI-1N - Options 2 and 3

No farm parcels are severed, and there are no farm building complexes in close proximity to the routes.

CHAPTER 5

LOCATION OF PHYSICAL/CHEMICAL TREATMENT PLANT FOR PARTIALLY INTEGRATED SITING OPTIONS

INTRODUCTION

A comparison of partially integrated siting options was undertaken to determine whether the preferred location of the physical/chemical treatment plant should be with the incinerator or with the landfill facility.

The siting options involved in this comparison are:

A. LF-1E/PI-27E
   1. the incinerator and physical/chemical treatment plant at PI-27E and the landfill at LF-1E, or
   2. the incinerator at PI-27E and the landfill and physical/chemical treatment plant at LF-1E

B. LF-4N/PI-13N
   1. the incinerator and physical/chemical treatment plant at PI-13N and the landfill at LF-4N or
   2. the incinerator at PI-13N and the physical/chemical treatment plant and landfill at LF-4N

C. LF-4N/PI-1N
   1. the incinerator and physical/chemical treatment plant at PI-1N and the landfill at LF-4N, or
   2. the incinerator at PI-1N and the landfill and physical/chemical treatment plant at LF-4N

NOTE: Siting options LF-2N/PI-1N and LF-2N/PI-13N were not included in this analysis because site LF-2N had been dropped from further consideration during the basic acceptability analysis (see Chapter 6).

The overall objective of the agricultural analysis was to minimize impact on agricultural resources. In order to accomplish this objective in the analysis of alternate locations for the physical/chemical treatment plant, the following were considered:

1. the character of agriculture around each site
2. impacts to agriculture in the immediate vicinity of the options
3. the potential impacts of moving different wastes at different stages of treatment along the transfer routes between sites
4. the potential impacts of moving reagent chemicals and additives used in the physical/chemical treatment process along the access routes to the sites
5. the combined impacts to agriculture in the vicinity and along access routes for each siting option

This chapter discusses the selection of factors and indicators, data the collection and compilation procedures, and the final ranking of options.

FRAMEWORK AND ASSUMPTIONS

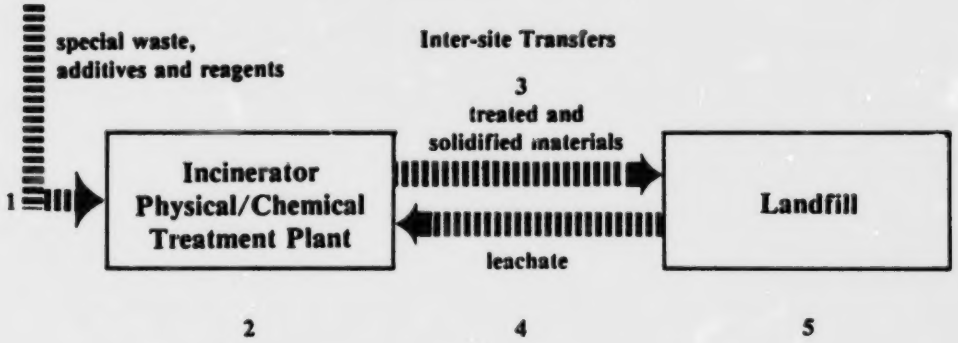
Consultants were required to rank each pair of options in order of preference. The data were compiled in matrix form and the options were ranked according to differences in the relative level of potential impact to agriculture in the vicinity of the sites and along transfer roads.

Figure 5-1 shows a schematic of the alternate siting configurations. The figure identifies the types of materials that will be transported to and between facilities. Impact data were summarized using this schematic in order to assist in comparing the possible location of treatment facilities within a partially integrated siting options.

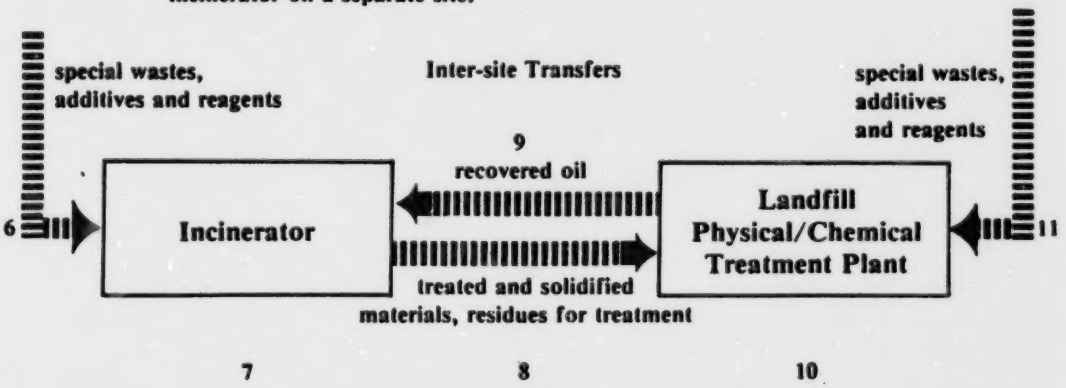
FIGURE 5-1

SCHEMATIC OF PARTIALLY INTEGRATED SITING OPTIONS

OPTION 1: The physical/chemical treatment plant with the incinerator and the landfill facility on a separate site.



OPTION 2: The physical/chemical treatment plant with the landfill facility and the incinerator on a separate site.



LEGEND

1 = access route for transporting - special waste, additives and reagents to the physical/chemical treatment plant
2 = site of the incinerator and the physical/chemical treatment plant
3 = inter-site transfer route for the treated and solidified materials from the incinerator and physical/chemical treatment plant to the landfill facility
4 = inter-site transfer of leachates from the landfill to the incinerator and physical/chemical treatment plant
5 = site of the landfill facility
6 = access route for transporting special wastes and additives and reagents to the incinerator
7 = incinerator site
8 = inter-site transfer route for transporting treated and solidified materials and residues for treatment from the incinerator to the landfill facility and physical/chemical treatment plant
9 = transfer route for transporting recovered oil from the physical/chemical treatment plant to the incinerator
10 = site of the physical/chemical treatment plant and the landfill facility
11 = access route for transporting special waste, additives and reagents to the physical/chemical treatment plant.

The following assumptions guided the analysis:

- All waste will be transported by road.
- All shipments of additives and reagents will arrive by road.
- Any direct impacts due to vehicle traffic on transfer routes will not extend beyond an 800 m impact zone on either side of the road (M.M. Dillon, 1985b).
- All shipments of special waste, additives and reagents, and transfers of treated waste will be made in the daytime and on work days only.

IDENTIFICATION OF FACTORS AND INDICATORS

The selected factors and indicators are outlined below:

STUDY AREA	FACTOR	INDICATOR
VICINITY	Disruption of Existing Farm Operations	- number of farms with headquarters in the vicinity
LOCAL COMMUNITY	Agricultural Community Impacts	- percent of land in non-farm uses - percent of farmland that is owned - percent of farmland in parcels
ACCESS ROADS	Disruption of Existing Farm Operations	- number of farms with headquarters - agricultural vehicle impact index

Farm businesses situated within 2 km of a site may be directly or indirectly affected by the operations of the treatment facilities. The number of farms with headquarters in this area (both owned and rented) provide a relative measure of the operators who could be affected by each siting combination.

The potential effects on agriculture of introducing industrial uses such as the physical/chemical treatment plant into an area where agriculture is the dominant activity will be greater than in areas where there are numerous non-agricultural activities. In order to determine if the preferred location of the physical/chemical treatment plant is with the incinerator or the landfill facility, it was necessary to consider the agricultural character of the local community around each siting option. It is preferable from an agricultural point of view to site facilities, particularly industrial facilities, away from the stable agricultural communities.

Three indicators were used to measure the stability of the agricultural community. The percent of land in non-farm uses measures the current degree of intrusion by non-agricultural uses. The percent of farmland owned by the farm operator indicates the degree of control exercised by farmers in determining the long-term use of the land. When farmers rent land, the long-term use of the land for agriculture is usually uncertain. The percent of farmland in large parcels (>12 ha) indicates the availability of land parcels that are large enough to be utilized efficiently by commercial farm operations. Non-farm development fragments farmland into small parcels that make commercial agriculture less efficient.

Transportation of materials may have an effect on farming activities along the access routes. The number of farms with headquarters on properties which abut the access roads provides a measure of the potential direct conflicts with farming activities. The trucks hauling these materials will also interfere with farm traffic on the access roads. The agricultural vehicle impact index indicates the potential for conflict between O.W.M.C. related traffic and farm machinery on access roads.

The selection of factors and indicators took into consideration concerns expressed by local residents and agencies regarding potential effects of the facility to the local agricultural community and activities along access routes.*

DATA COLLECTION AND ANALYSIS

The indicator data were obtained from the following sources:

1. Interviews with Farm Operators (Appendix B).
   - number of farms with headquarters
   - percent of non-farm properties
   - percent of farmland that is owned
   - percent of farmland in parcels >12.6 ha
2. Access Road Questionnaires (Appendix B)
   - number of farms with headquarters
   - number of trips by farm machinery

An index of `agricultural stability´ was prepared for use in conjunction with the indicators of the vicinity characteristics. The index was compiled as follows:

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*Refer to the Elcho Site Study Committee of the Chippawa Watershed Association, August 1, 1984, the Schram Study Committee of the West Lincoln Task Force Against Toxic Waste, October 1, 1984, the Omagh United Taxpayers, July 30, 1984 and the Regional Municipality of Niagara, July 30, 1984, position papers submitted to O.W.M.C.

1. All properties were categorized as farm or non-farm. Farm properties were further categorized by type of tenure (owned or rented) and by size (0-4.5 ha, 4.6-12.5 ha, 12.6-30.5 ha and above 30.5 ha).

2. The proportion of the total hectares in each category was determined.

3. Weights ranging from 0 to 1.0 were assigned to each category. Higher values signified that a category was more conducive to stable commercial agriculture. The weights are as follows:

	SIZE	OWNED	LEASED
NON-FARM:	All sizes	0.00	0.00
FARM:	0 - 4.5 ha	.25	.20
	4.6 - 12.5 ha	.50	.40
	12.6 - 30.5 ha	.75	.60
	>30.5 ha	1.00	.80

4. The proportions of total community area in each category expressed as fractions, were multiplied by the category weights and the resulting values were summed to give the final index. Index values fall between zero and 1.0.

Transportation risk was accounted for in the compilation of the agricultural vehicle impact index.

An impact index was calculated by M. M. Dillon (1985b) for each access route combination on the basis of forecasted truck traffic volumes, and the number of trips with farm equipment. The procedure for determining the number of trips is described in Appendix C, Section 5.

The data and indices are shown schematically in Figure E-1, Appendix E.

RANKING OF OPTIONS

Selection of the preferred option within each pair of partially integrated siting options was based on a critical inspection of the data. In this case, all factors were given an equal weight. The preferred option is the one which minimizes the impacts to the agricultural community in the vicinity of the sites and along the access roads.

The results of the comparative analysis of partially integrated siting options are outlined below:

LF-1E-PI-27E

Option 1 with the incinerator and physical/chemical treatment plant at PI-27E and the landfill facility at LF-1E is preferred.

The data show that agriculture at LF-1E is more viable than at PI-27E. Option 1 will minimize the risk of impact on the access road and in the agricultural community at LF-1E.

LF-4N/PI-13N

The data show relatively minor differences between the access road and community exposure when sites are compared. The options are considered to be approximately equal.

LF-4N/PI-1N

Option 1 with the incinerator and physical chemical treatment plant at PI-1N and the landfill at LF-4N is preferred.

The data show relatively minor differences between the access road and agricultural community characteristics. Option 1 minimizes the access road and community impacts at both sites.

PREFERRED SITING OPTIONS

The final siting options selected by the O.W.M.C. Site Selection Team are described below. Refer to the M.M. Dillon (1985a) report for details.

LF-1E AND PI-27E

- the incinerator and physical chemical treatment plant at PI-27E and the landfill at LF-1E

LF-4N AND PI-1N

- the incinerator and physical chemical treatment plant at PI-1N and the landfill at LF-4N

LF-4N AND PI-13N

- the incinerator and physical chemical treatment plant at PI-13N and the landfill at LF-4N

CHAPTER 6

COMPARISON OF SITING OPTIONS

INTRODUCTION

PURPOSE AND SCOPE

The final step in the site evaluation process included the basic acceptability analysis and the detailed comparative evaluation of siting options. The basic acceptability analysis involved the identification of any constraints severe enough to warrant dropping a site from further consideration. The detailed comparative evaluation involved a screening and combination of factors and indicators to compare the siting options. At this stage it was possible to view each alternative as a complete system, each with a preferred access road(s), preferred location of the physical/chemical treatment plant and preferred site boundaries. The objective of this final stage was to select a preferred siting option.

This report documents the data collection and analysis procedures up to the point where the agricultural factors are ranked and the sites compared on the basis of these factors. Thereafter, the documentation of the way in which the factors were combined with the non-agricultural factors to select the preferred site(s) is found in the M.M. Dillon (1985a) report.

CHAPTER ORGANIZATION

This chapter presents the factors and indicators used in the basic acceptability and comparative evaluation of siting options and summarizes

the data collection procedures and analysis. The results of the basic acceptability analysis are presented. Summary descriptions of the existing environments of the siting options are given followed by a matrix of the data used in the comparisons. (Complete descriptions of the data collection and analysis procedures appear in Appendices B and C while complete site descriptions appear in Appendix D.)

Next, the chapter describes the rationale and the ranking of indicators and factors and then describes how these were applied to the data. Suitability levels for each of the factors are then presented by siting option. These are followed by a discussion of the major differences between the siting options from an agricultural perspective and of the major issues and trade-offs that are involved in the choice between these options. The chapter concludes with a set of sensitivity analyses which test the implications on site ranking of a variety of assumptions that were made in the analysis.

FRAMEWORK AND ASSUMPTIONS

The framework for the analysis was again governed by the agricultural analysis system described in Chapter 1. However, it was also governed by the configuration of the preferred system components - access roads, location of the physical/chemical treatment plant and site boundaries - and by assumptions about facility characteristics, construction and operational procedures (see Appendix F). The following assumptions also guided the analysis.

1. All present agricultural activities on-site will be displaced.

2. Because of the relatively small number of the facility workers (construction and operations), their expected points of residency outside the project area and because of the ability of land use regulating authorities to control land use conversions, it is assumed that significant secondary impacts on agriculture will not occur as a result of non-agricultural land use pressures associated with the new O.W.M.C. facility.

3. Noise levels from the construction and operation of the facilities and trucks on access roads will not be of the type and severity that will have a significant impact on livestock or poultry on adjacent lands.

With the above as background it was then possible to select study areas or zones of influence for facility components within which to estimate relative potentials for impact. The study areas utilized in the comparison of siting options, as defined in Appendix A, were:

- site acquisition areas
- site vicinity
- community
- region
- access road corridor

At this more detailed level of analysis with primary data sources available, it was possible to sub-divide the vicinity study area into two zones: adjacent farm operations and non-adjacent farm operations. These are defined in Appendix A. The reason for this distinction is the larger impact potential of farms with headquarters situated adjacent to the site(s).

In addition to the spatial frame of reference for impact potentials, it was necessary to define time horizons over which impacts might be experienced: the construction phase, operational phase, and the post-operational phase. Table 6-1 relates the time frames and study areas to the factors that are outlined in the next section.

As noted in Chapter 1, the prediction of impacts associated with the facilities and their operations should, as much as possible, reflect conditions when facilities are at peak operation. A basic problem in making such predictions is the dependence on data about existing conditions.

To partially resolve this problem, the analysis utilized information from the land use consultant (L.K.A., 1985) about areas in which municipalities have determined that non-agricultural land uses will displace current agricultural activity. Such areas are those normally designated in official plans for future industrial, commercial, institutional or residential uses.

An assumption was therefore made in the agricultural analysis that any area on-site or beyond, which has been designated for non-agricultural use, would ultimately be converted to that use and, thus, removed from agriculture. Consequently, existing agricultural uses in such areas were deleted from the data base for the comparison of siting options. The implication of this assumption to the ranking of siting options is tested in the sensitivity analysis at the end of this chapter.

The implications of future land use changes on the results of the ranking of siting options were also considered. Qualitative assessments of "future scenarios" performed by L.K.A. (1985) and I.E.R. (1985) were evaluated relative to trend information in the Phase 3B "Urbanization" report (Ecologistics Limited and Deloitte, Haskins and Sells Associates;

TABLE 6-1

STUDY AREAS AND TIME FRAMES

Factor	STUDY AREA					TIME FRAME		
	Site	Vicinity	Community	Region	Access Roads	Construction Phase	Operational Phase	Post-Operational Phase
1. Displacement of farms with On-Site Headquarters	x					x	x	x
2. Loss of farmland	x					x	x	x
3. Partial Displacement of Farms	x	x				x	x	x
4. Disruption of Adjacent Farm Operations		x				x	x	x
5. Disruption of Non-Adjacent Farm Operations		x				x	x	x
6. Stability of Farm Population			x				x	
7. Stability of Agricultural Land Base			x				x	
8. Disruption to the Farm Economy				x			x	
9. Disruption to Farm Traffic and Cattle Crossings					x	x	x	
10. Disruption to Crop and Livestock Production (Access Roads)					x		x	

1984) to project possible changes in the character of agriculture around the sites. These results were examined in a further sensitivity analysis to assess the effects on ranking of siting options.

The specific framework for the comparison of siting options was again the site selection objectives as they relate to agricultural concerns. The comparison was based on relative potentials for impact on agricultural production systems:

- impact on land productivity, present and future
- impact on local and regional agricultural economic systems
- impact on agricultural communities

IDENTIFICATION OF FACTORS, INDICATORS AND SUB-INDICATORS

The purpose of this section is to describe the factors, indicators and sub-indicators used in the basic acceptability analysis and detailed comparative evaluation of siting options. The objective in selecting factors was to encompass all significant agricultural concerns associated with the construction and operation of O.W.M.C. waste treatment facilities.

The specific objectives for factor selection were:

- to select factors which differentiate the siting options based on the relative potential of various aspects of the O.W.M.C. waste treatment facility to impact on agriculture
- to select indicators that adequately describe the factor and that allow for consistent, relative comparisons among siting options

The factor expresses the area of concern or type of potential impact whereas the indicator serves as a way of measuring the factor, especially when one factor consists of several sub-sets of information. In some instances indicators were also broken down into sub-indicators which provide more precise measurements of differences among siting options. The methods by which these are aggregated or combined is outlined later in the chapter.

An extensive list of factors, indicators and sub-indicators was prepared to encompass the range of potential effects on agricultural resources relative to agricultural conditions in the study areas under consideration. It was recognized that the types of agricultural activities and degrees of potential effects would depend upon the location of the activity or feature relative to O.W.M.C.'s facilities and activities.

As much as possible, indicators were expressed in terms of impact potential. In some cases direct impacts could be quantified whereas in other cases it was only possible to indicate the relative potential for impacts. Most direct impacts such as the displacement of a farm business or the loss of farmland can be easily measured. Indirect impacts, such as those which may be experienced by farm operations adjacent to the site are more difficult to quantify. However, the number of operations in this position with each siting option can be determined. For the purposes of comparing siting options, data about the number of adjacent farm operations can be used as proxies to show relative differences among options in terms of potential impacts.

There is another type of potential, indirect impact that is more difficult to incorporate into the comparative analysis. These are impacts which may or may not materialize and which are almost impossible to quantify for comparative purposes, even through the use of proxies. An

example is the effect of public perception on the ability of farmers to market product grown or raised in close proximity to the site.

Such concerns have been documented by the Elcho Site Study Committee of the Chippawa Watershed Association (August 1, 1984), the Schram Study Committee of the West Lincoln Task Force Against Toxic Waste (October 1, 1984), the Omagh United Taxpayers (July 30, 1984) and the Niagara North and South Federations of Agriculture (June 4, 1985). Even though none of the technical analyses to-date suggest problems in terms of the safe production of crops and livestock, consumers may or may not believe these technical analyses.

Because it is impossible to gauge or measure this sort of public/consumer perception (especially before it occurs), the analysis has dealt with qualitative concerns differently than those expressed quantitatively.

In part, this concern is addressed in the regional factors (gross farm revenue, relative exposure of crops and livestock to emissions) where it may be assumed that the degree of impact due to consumer reaction would be proportionate to the gross farm revenues and/or crop and livestock exposure indices. However, this assumption fails to differentiate among the types of enterprises that might be affected by consumer response. For example, pick-your-own and other types of market gardening are likely to be more vulnerable than cash grain farming.

The solution to this problem was to first conduct the quantitative comparative analysis and to rank the siting options on that basis. Next, they were compared in respect to the qualitative considerations. Where any changes in the relative ranking of sites warranted, these were supported by specific reasons.

The factors and indicators selected to represent the agricultural concerns are listed in Table 6-2. The rationale for this selection is summarized below. More complete descriptions of the factors, rationale and significance, data sources, etc. are found on factor data sheets in Appendix A.

SITE

1. Displacement of farms with on-site headquarters

This factor was selected since individual farm businesses are the foundation on which the province's agricultural industry is built. Displacement means the removal of complete farm operations, i.e. farm operations where the headquarters are situated on-site but other associated properties may be off-site. Displacement of land parcels with off-site headquarters is dealt with in another factor.

Indicators and sub-indicators which describe the variable aspects and dimensions of this factor are:

- number of farms with on-site headquarters
  - number of headquarters owned
  - number of headquarters rented
- average size of farms
  - average size of farms with on-site owned land
  - average size of farms with on-site rented land
- estimated gross farm revenue from on-site farmlands

Number of farms with on-site headquarters was divided into sub-indicators; number owned and number rented. The impact potential is greater for owned operations because of a substantial financial and personal tie to the operation in its present location. The indicator, average farm size measured in hectares includes the total land holdings for operations with headquarters on-site.

TABLE 6-2

SUMMARY OF DATA SOURCES FOR AGRICULTURAL INDICATORS

STUDY AREA	FACTOR	INDICATOR	DATA SOURCE
Site	Displacement of Farms with On-Site Headquarters	. no. of farms with on-site headquarters	. site and vicinity questionnaire
		. average size of farms	. site and vicinity questionnaire
		. estimated gross farm revenue	. site and vicinity questionnaire, OMAF Statistics
Site	Loss of Farmland	. soil capability	. on-site soil survey
		. tile drainage	. site and vicinity questionnaire
Vicinity	Partial Displacement of Farms	. no. of farm operations affected	. site and vicinity questionnaire
		. average size of lost parcels	. site and vicinity questionnaire
		. proportion of land base lost	. site and vicinity questionnaire
Vicinity	Disruption of Adjacent Farm Operations	. no. of farm operations with headquarters	. site and vicinity questionnaire
		. no. of operations with owned land	. site and vicinity questionnaire
		. livestock density	. site and vicinity questionnaire
Vicinity	Disruption of Non-Adjacent Farm Operations	. no. of farm operations with headquarters	. site and vicinity questionnaire
		. proportion of land in crops	. site and vicinity questionnaire
		. livestock density	. site and vicinity questionnaire
Community	Stability of Farm Population	. age of operators	. Institute of Environmental Research
		. full-time operators (% of total operators)	. site and vicinity questionnaire

TABLE 6-2 - cont'd

SUMMARY OF DATA SOURCES FOR AGRICULTURAL INDICATORS

STUDY AREA	FACTOR	INDICATOR	DATA SOURCE
Community	Stability of Agricultural Land Base	. land tenure	. site and vicinity questionnaire
		. farm residences (percent of total residences)	. Institute of Environmental Research
		. agriculturally designated land	. CLI soil capability and Leon Kentridge Associates
		. private land ownership	. Ministry of Revenue
Region	Disruption to the Farm Economy	. gross farm revenue	. 1981 Census of Agriculture
		. relative crop and livestock exposure to fugitive emissions	. site and vicinity questionnaire, field surveys, Land Use Systems Mapping
		. relative crop and livestock exposure to stack emissions	. site and vicinity questionnaire, meetings with farmers and farm agencies, 1981 Census of Agriculture
		. exposure of downstream livestock	. Land Use Systems Mapping
Access Roads	Disruption to Farm Traffic and Cattle Crossings	. local roads	. access roads questionnaire, M.M. Dillon
		. regional roads	. access road questionnaire, M.M. Dillon
Access Roads	Disruption to Crop and Livestock Production	. adjacent crops	. access road questionnaire
		. adjacent livestock	. access road questionnaire
		. downstream livestock	. Land Use Systems Mapping

Two sub-indicators distinguish between the on-site land of these operations that are either owned or rented. Generally, the larger the average size of the displaced land, the larger the impact on the affected farm operation. The impact is also larger when the on-site land is owned. The final indicator for this factor is estimated gross farm revenue for all on-site farmlands. This indicator measures the potential productivity of current on-site crops and associated livestock and is reported in dollars per year per siting option. Such units allow ready comparison between siting options. Procedures for calculating farm revenue are described in Appendix C.

2. Loss of farmland

Loss of a productive, non-renewable resource of provincial significance would result from siting a waste treatment facility on high quality agricultural land. This factor is represented by the following indicators: soil capability and tile drainage.

Soil capability was measured by hectares of Class 1 equivalent land; this shows which site acquisition area has the highest crop production potential assuming that all inherent soil limitations such as poor drainage are overcome through conventional soil management practices.

Tile drainage improves the production potential of a wet soil by removing excess moisture from the plant root zone. Therefore, the more tile on lands needing improved drainage, the higher the production potential.

SITE VICINITY

3. Partial displacement of farms refers to the loss of on-site farmland by farms with headquarters located off-site. The loss of a portion of

the land base could constitute a significant impact on the viability of an operation, especially if replacement land is not readily available. The degree of impact is primarily a function of the proportion of the land base that is lost. The three sub-indicators are numbers of farm operations affected, the average size of lost parcels and the proportion of land base lost measure the degree of impact.

4. Disruption of adjacent farm operations

Disruption of farm operations adjacent to the waste treatment facility could be due to property devaluation, nuisance effects and effects of stack and/or fugitive emissions. Disruption of operations could result in economic losses to the farm operators, and the local community. Indicators and sub-indicators used to characterize this factor are:

- number of farm operations with headquarters
- number of operations with owned land
- livestock density

The number of farm operations with headquarters is a direct measure of the number of farm operators and farm families headquartered adjacent to the site(s) that could be affected on a day-to-day basis by the operations of the facilities. The number of operations with owned land adjacent to the site(s) acknowledges that potential impacts such as property devaluation would be of greatest concern to operators who own land adjacent to the site.

Livestock density expressed in animal units per hectare (see Appendix A for definition) indicates the intensity of livestock rearing activities. Generally, livestock operations require a higher level of investment in infrastructure (buildings, etc.). Therefore, livestock density is used as an indirect measure of the potential for impact on adjacent farm infrastructure.

5. Disruption of non-adjacent vicinity farm operations

This factor relates to farm operations with owned and rented headquarters situated between the adjacent properties and those which extend out to approximately 2 km from the site centre (see Appendix A for a more detailed definition). Such operations will be less vulnerable to potential impacts such as property devaluation, but will generally lie within the zone of direct influence of the facilities. The facilities will be visible from most of these properties and thus the perception of impacts will be present, at least for a period of time after start-up of operations.

Generally, the more intensive the level of agricultural activity, the higher the potential for impact. The indicators and sub-indicators measure the relative levels of intensity. Numbers of farm operations with headquarters indicates the number of operators and their families that could be affected. The proportion of land in crops and the livestock density indicate the levels of agricultural land use intensity and levels of investment in production facilities.

COMMUNITY

6. Stability of farm populations

This factor helps to describe the degree of stability and viability of farming as a way of life, as well as a business. Two indicators, the age of operators and the number of full-time operators describe this factor.

Age of operators was measured as percent of farm operators who are under the age of 55. Fifty-five was chosen as an age at which many farmers begin the transition to retirement. There are, of course, many exceptions and there is no standard age at which farmers "retire." A large percentage under age 55 would suggest that many of

the operators in the community would have heavier debt loads (because they are younger) and would be more vulnerable to impacts imposed by the waste treatment facility. Long established operators would generally be less vulnerable to this particular type of impact.

Full-time operators (as a percent of total operators), as defined by the operators themselves during the interviews, is used to indicate the extent to which the operators are dependent on agriculture as their main income source. For comparative evaluation purposes, only those operators who reported no off-farm employment were included. This indicator also demonstrates the degree of non-commercial scale agricultural activity in the community. Areas with a high proportion of part-time farmers will generally be less productive in terms of agricultural outputs.

7. Stability of the land base

The stability of the land base is a second important barometer of the stability and viability of an area for long-term commercial scale agriculture. As discussed in the Phase 3B Urbanization Report, the intrusion of non-agricultural activities and pressures, past and/or present, into a farming community weakens its level of gross agricultural output. A recent paper by van Vurren (1983) further documents this phenomenon. The tendency should, therefore, be to locate in an area which has to-date experienced these pressures rather than in one which has been relatively free of them.

The indicators selected for depicting the degree of urbanization that has taken place are land tenure and farm residences (as a percent of total residences). As discussed in the Phase 3B Urbanization Report, changes in the traditional form of land tenure are indicative of urban pressures. A high proportion of land farmed on a rental basis and fragmentation of land into small parcels usually lead to less

productive and inefficient use of the land for farming. The measures, or sub-indicators of strength in agricultural land tenure are the proportion of land in parcels greater than 12.6 ha, the proportion of farmland owned, and the proportion of area farmed.

Farm residences (as a percent of total residences) indicates the extent to which non-farm residential development has extended into the area. High levels of this form of development increase the potential for conflicts between residents and normal farming operations. Such conflicts can lead to a decline in the farming outlook for the area. They also add pressure on land prices and consequently make farm entry by new farmers more difficult.

The amount of agriculturally designated land (as Class 1 equivalents) indicates two features; first, that a municipality has generally declared that agricultural land uses should dominate the area and secondly, the relative quality of the land that has been designated. The general tendency should be to avoid lands designated for agriculture or, where not possible, to select an area with the least amount of Class 1 equivalent land in its surroundings.

For this indicator the number of Class 1 equivalents in the local community area on lands designated for agricultural or rural uses were calculated as a percent of the total community area.

Private land ownership measures the percentage of the 0-2 km zone that is in private ownership. A high proportion of publicly owned land introduces uncertainty about the area's future for agriculture. Generally, the preference is to use publicly owned land rather than land owned and operated by farmers.

REGION

8. Disruption to the regional farm economy

The operation of a treatment and disposal facility is viewed as a non-compatible use in an agricultural area. There are essentially no features of these operations that support or in any way enhance agricultural productivity and the agricultural community. The extent to which they may inhibit or prove detrimental to existing agriculture or to its future development is difficult to predict. Research into the effects of comparable facilities on agriculture is almost non-existent. Nevertheless, this is a major concern of agricultural organizations and agricultural operators situated in the general area of the candidate sites.

In the absence of data on cause and effect relationships, the preferred approach is to avoid as much as possible those area where agricultural activity is the strongest and where crops and livestock are most prevalent within the regional zone of influence.

A general indicator of the strength of agricultural activity is gross farm revenue. This indicator measures the level of output in dollar terms as reported in the 1981 Census for a 0-5 km zone around the sites.

Extending also to the 5 km limit is the indicator relative crops and livestock exposure to fugitive emissions, i.e. emissions from the operations area of the plant. The indicator relative crops and livestock exposure to stack emissions applies within a 0-20 km zone. The analysis is developed incrementally: in 0-2 km, 2-5 km, 5-10 km and 10-20 km zones. A preliminary assessment of potentially sensitive crops was made in Phase 3B on the basis of information available at that time. In the "Sensitive Crop" report (Ecologistics Limited and Deloitte, Haskins and Sells Associates; 1984) a list was prepared

which covered the potential for both bioaccumulation and for plant injury due to contaminants. As a result of additional engineering design and refinements in the air emissions modelling, a reassessment of the initial "sensitive" crop list was possible.

Because of the division between risk and impact factors in the Phase 4A analysis, it was necessary to view the list from two separate points of view: bioaccumulation relative to risk to human health and, risk of damage to the crop as an economic resource. The following discussion relates only to economic impact potential. Treatment of the data for use in the risk factors appears on page 113 and in Appendix C.

The reassessment of the economic damage component commenced with a revised list from O.R.F. of chemicals in the emissions. These were used as inputs to an extensive literature review which covered all of the major papers in the scientific literature relative to damage from foliar uptake of the relevant classes of chemicals. Results of this work were used to establish, wherever possible, sensitivity thresholds (Crop Sensitivity to Foliar Uptake of Air Contaminants. Working paper; Ecologistics Limited, 1985).

In many cases there is no research, in some cases there is little research information and in other cases there is substantial research information upon which to base threshold values. The analysis, however, concluded that the projected ground level concentrations provided by O.R.F. were well below the threshold values for visible injury. They were also well below the standards set by the Ontario Ministry of the Environment.

Notwithstanding the conclusion that projected emission levels do not appear to pose a threat to crop yield and quality, the potential for crop damage was retained as a site selection factor. This is

consistent with the general principles of the site selection process in which the process itself is used to reduce as much as possible the risk of a significant impact.

Table 6-3 compares the crop list in Phase 3B with the Phase 4A list. It shows those crops in Phase 3B that were included because of potential for visible injury. Some of these had been included because of potential for bioaccumulation. Three crops, alfalfa, clover and soybeans were considered as potentially sensitive but were not included in the analysis, largely because their potential for visible injury is considered `marginal' based on the available literature. The implication of this assumption was tested in the sensitivity analysis which is discussed later in this chapter.

For livestock, population level for the full range of livestock and poultry being reared in the air dispersion zones were determined.

The extent of crops and livestock, exposed to fugitive and stack emissions within the air dispersion zones, was measured on a dollar basis, then integrated into an air dispersion analysis by O.R.F. The results of the O.R.F. analysis were expressed ultimately as relative exposure indices (see Appendix C).

The last regional-scale indicator is exposure of downstream livestock to potential spills into streams. This acknowledges that a potential exists, albeit very small, for a spill to escape from the site, gain access to a watercourse and be ingested by livestock using a downstream water supply. The analysis was extended downstream to Lakes Erie or Ontario or to the Niagara River or Chippawa Power Canal.

TABLE 6-3

COMPARISON OF PHASE 3B AND PHASE 4A
SENSITIVE CROP LISTS

PHASE 3B	PHASE 4A
VISIBLE INJURY AND BIOACCUMULATION	VISIBLE INJURY
Asparagus	Asparagus
Cabbage	Cabbage
Cauliflower	Cauliflower
Broccoli	Broccoli
Lettuce	Lettuce
Bean (Wax, Green, Snap)	Bean (Wax, Green, Snap)
Cucumber	Cucumber
Tomato	Tomato
Apple	Apple
Apricot	Apricot
Cherry	Cherry
Grape	Grape
Peach	Peach
Pear	Pear
Plum and Prune	Plum and Prune
Strawberry	Strawberry
Forage Corn*	
Oats (for fodder)*	
Alfalfa, Clover, Grass*	
Dry Field Bean**	
Soybean	
	Potato
	Pea (Green)

*These crops included due to relative accumulation of contaminants in edible tissue.

**Not grown commercially in the study areas.

ACCESS ROADS

9. Disruption to farm traffic and cattle crossings

This factor assesses the potential for waste hauling vehicles to collide with farm vehicles and machinery being moved along the access roads. It also assesses the potential for conflict between the waste haulers, cattle moving across or along the access roads, and farm customers. Since the degree of conflict will be different between local and regional roads, these have been introduced as indicators. The sub-indicators measuring differences between siting options consist of an agricultural vehicle impact index, which indicates the conflict potential between O.W.M.C. trucks and farm machinery, the number of customer and service vehicle stops and the number of cattle crossings.

10. Disruption to crop and livestock production

This factor recognizes that crops and/or livestock adjacent to or downstream of an access road could be exposed to toxic chemicals in liquid, solid and/or gaseous form in the event of a spill on the access road. While an emergency response mechanism will be in place to contain a spill as quickly as possible and to clean it up, there is a potential for crops and livestock to be exposed.

The presence of crops and livestock was estimated from interviews with farm operators and windshield surveys within an 800 m zone on either side of the access road. As well, the probability of cattle being exposed to a spill into a watercourse was estimated by determining the extent of pasture land downstream of each access road. The specific indicators for this factor are adjacent crops, adjacent livestock and downstream livestock potentially affected by spills into streams.

DATA COLLECTION AND ANALYSIS

DATA COLLECTION

Most of the data used in the analysis of siting options came from the questionnaire survey completed during the "Walk and Talk" program when virtually all farm operators were contacted. A very high percentage of those contacted consented to a personal interview and responded to most of the questions. Interviews for the sites and site vicinities took place within an area designated as the "agricultural study area". The limits of these areas are shown on Maps 9 to 16. These maps are found in Site Selection Process. Phase 4A: Selection of a Preferred Site(s) - Agriculture. Technical Data Map Portfolio (Ecologistics Limited and Deloitte, Haskins and Sells Associates; 1985).

Interviews were also carried out with operators who have farms abutting the preferred access roads. Mail back survey forms were left with those operators who could not be contacted.

Appendix B contains a detailed description of the questionnaires and the procedures followed in contacting and interviewing landowners.

As the interviews were completed in the field they were forwarded to the office for coding and key punching so that the results could be stored in a computer and summarized as needed for the analysis. A rigorous system of checks and cross-checks was followed to ensure that all properties were accounted for in the data base. Even so, a few properties that were missed initially were discovered during meetings with the public; these were subsequently added to the data base.

The extent to which indicator data were obtained from the questionnaire is shown in Table 6-2. The table also lists other data sources.

Field data were also collected for on-site agricultural soil conditions. Field procedures were developed in consultation with the Ontario Institute of Pedology (O.I.P.) and carried out by the consultant's staff. Soils were sampled and mapped on all properties where permission was obtained from the landowner; most of the landowners granted access to their properties for this purpose. The areas surveyed were the initial, larger site acquisition boundaries. Details of the soil mapping procedure appear in Appendix B.

Field crops were also inventoried during the "Walk and Talk" program in the agricultural study area. They were plotted on photo base maps during interviews with farm operators and, in cases where interviews were not possible, were inventoried from the roadside and/or neighbouring properties.

A windshield survey was utilized for mapping crops in the 800 m band along the access roads. Where crops could not been seen from the road an aerial survey was undertaken to complete the inventory.

In the 2-5 km zone, an effort was made to augment existing data sources on crops and livestock populations. For crops a field sampling procedure was employed for the purpose of verifying and detailing land use system maps of the Ontario Ministry of Agriculture and Food. Livestock were documented by type and numbers through a series of meetings with local farm operators, O.M.A.F. field personnel and information obtained from certain marketing boards and commodity groups.

For the exposure of downstream livestock, the number of times that hay or grazing systems (on the Land Use Systems Maps, O.M.A.F. and Agriculture Canada) were crossed by streams downstream of the site and access roads was counted.

All of the specific data sources, data collection, checking and compilation techniques are outlined in Appendix B.

ANALYSIS

In order for the inventory data to be used in the comparison of siting options, it was first necessary to undertake several analytical procedures. Details of the analytical methods are contained in Appendix C; summaries of the methods appear below.

Soil Capability

The field data from the soil survey were plotted on base maps and soil map climate units delineated. Each map unit was assigned a capability rating comparable to O.I.P. ratings for similar soil types in the county or region. The area of each soil map unit was measured and the area of each soil type and CLI soil capability rating tabulated for each site acquisition area.

Following completion of the field mapping, data compilation and analysis tasks, O.I.P. released a revised set of soil capability ratings for the soils of Niagara Region (O.I.P., 1985). Generally, the effect of these changes was to downgrade a number of Class 2 soils to Class 3 and some Class 3 to Class 4 soils. The O.I.P. has indicated that a similar downgrading of soil capability classes may occur for the soils in Halton Region if the same rating criteria are applied. Consequently, the relativity of the sites, from a soil capability perspective, in Halton and Niagara Region would remain unchanged. However, since new capability ratings have been released for Niagara but not Halton Region, a sensitivity analysis was performed to determine the effect of the revised Niagara Region ratings on the comparative evaluation.

Results of the sensitivity analysis appear at the end of this chapter. They show that no significant change in the ranking of siting options results from changes in the site soil capability ratings. Consequently, no change was made in the soil maps and analysis which were based on the rating system available at the time.

One further consideration in the rating of soils relative to agricultural capability is the influence of climate. It was suggested at a Phase 3B, O.W.M.C. Workshop that the Niagara Region portion of the candidate region has the most favourable climate and should thus be given higher capability ratings. The agricultural consultant indicated that this question would be addressed in Phase 4A.

The revised O.I.P. soil capability ratings speak to this point. In developing the ratings, O.I.P. has taken both soil and climatic characteristics into account. The result is lower, not higher capability ratings for Niagara Region, largely because of the fine textured clay soils which tend to delay the timing of spring seeding. A later planting date generally results in lower crop yields. Therefore, the agricultural consultant made no changes in the capability ratings due to climatic considerations.

Crop and Livestock Inputs to Emissions Modelling

Data on the presence of crops and livestock in the air dispersion zones (0-2, 2-5, 5-20 km) were required for use in the assessment of potential impacts from atmospheric emissions. The crops and livestock data were provided to O.R.F. for integration with their emission and dispersion modelling. Information on the modelling procedure and grid cell layout is available in the O.R.F. (1985) report. The inputs to this modelling relate in part to the assessment of risk to human health via crop and livestock pathways and to the potential for economic damage to crops and livestock.

Since it was desirable in the atmospheric emissions modelling to derive a single value per cell in the dispersion model for crops and livestock, it was necessary to convert all crops to a common denominator and to do the same for all livestock. To accomplish this for the impact factors, average dollar values were estimated for 1978-82 crop yields (O.M.A.F.) and these were multiplied by the area of each sensitive crop in each cell. The net result was a dollar value for all crops in each cell. A similar procedure and result was obtained for livestock. Lastly, the crop and livestock values for each cell were combined with a mean concentration value to produce indices of relative exposure.

For the inputs to O.R.F.'s risk factors, all edible crops and all livestock and livestock products consumed by humans were tabulated for the dispersion modelling cells. The common denominator for these crops and livestock was product weights. Details on this procedure are found in Appendix C.

Land Ownership

Based on the results of landowner interviews, all properties within the agricultural study area were coded as "farm" or "non-farm". Farm properties were further differentiated as either owner-operated or tenant operated. Graphs were prepared for each siting option showing the proportion of farmland that is operator owned versus rented (see Appendix D). This was done for each property size Class (0-4.5, 4.5-12.5, 12.5-30.5, 30.5+ ha) and was contrasted with the amount on non-farm land.

Gross Farm Revenue

Two sets of estimated gross farm revenue calculations were produced, one for on-site farm businesses and one for farm businesses within the 0-5 km zone.

The calculations of gross revenue for on-site farm businesses were based on the property, crop and livestock information obtained during the interviews. These data were then utilized in an estimating procedure to derive an average dollar value per hectare for each business. These in turn were aggregated for the total site.

It was hoped initially that the question on the interview form about actual gross farm income would provide the basis for the calculation. Since the responses to this question were minimal it was necessary to utilize an estimating procedure. The results of this procedure produced gross farm income estimates that are significantly different among several sites even when allowing for a reasonable margin of error in the assumptions and calculation procedure.

For estimation of regional gross farm revenue, in the 0-5 km zone, data reported in the 1981 Agricultural Census on gross farm sales were used. Values for each enumeration area were first determined and then the air dispersion grid map was overlaid on the enumeration area map. Values for each air dispersion cell were determined by determining weighted averages for the E.A.'s intersected by the grid cells.

Agricultural Vehicle Impact Index

An agricultural vehicle impact index was derived to indicate the potential for conflict between O.W.M.C. traffic and farm machinery traffic on access roads. The number of trips with farm equipment on each access road were combined with forecasted traffic volumes.

Refer to the M.M. Dillon (1985b) report for further details.

BASIC ACCEPTABILITY

This analysis was performed by each of the site selection consultants to determine whether the more detailed data collection and analysis in Phase 4A had revealed any severe constraints which ought to preclude further consideration of a site.

As discussed in Chapter 3, it was the opinion of the agricultural consultant that none of the agricultural factors and none of the data relevant to the siting options warranted exclusion of a site on the basis of agricultural considerations alone. No regulations, standards, criteria or guidelines exist which establish relevant thresholds that can be directly applied. Of significance, indirectly, are air emission and groundwater standards which, complied with, will protect agricultural resources. Also, as noted in the Phase 3B "Agricultural" report (Ecologistics Limited and Deloitte, Haskins and Sells Associates; 1984), the "Foodland Guidelines, A Policy Statement of the Government of Ontario on Planning for Agriculture" (Government of Ontario, 1978) do not preclude the siting of such facilities in an agricultural area.

It is also significant to note that the highest priority agricultural lands, i.e. the tender fruit growing areas of the Niagara Peninsula and other market gardening areas were excluded as potential sites at an early stage in the site selection process.

When the basic acceptability analysis was completed by all of the site selection consultants, a decision was made to drop site LF-2N in Mississauga because of unsatisfactory hydrogeologic conditions revealed by on-site drilling. For more detail on this decision refer to the "Site Selection" report (M.M. Dillon, 1985a).

As a consequence of this decision, the two site combinations associated with LF-2N, i.e. LF-2N/PI-1N and LF-2N/PI-13N, were dropped from further consideration. The remaining six siting options were as follows:

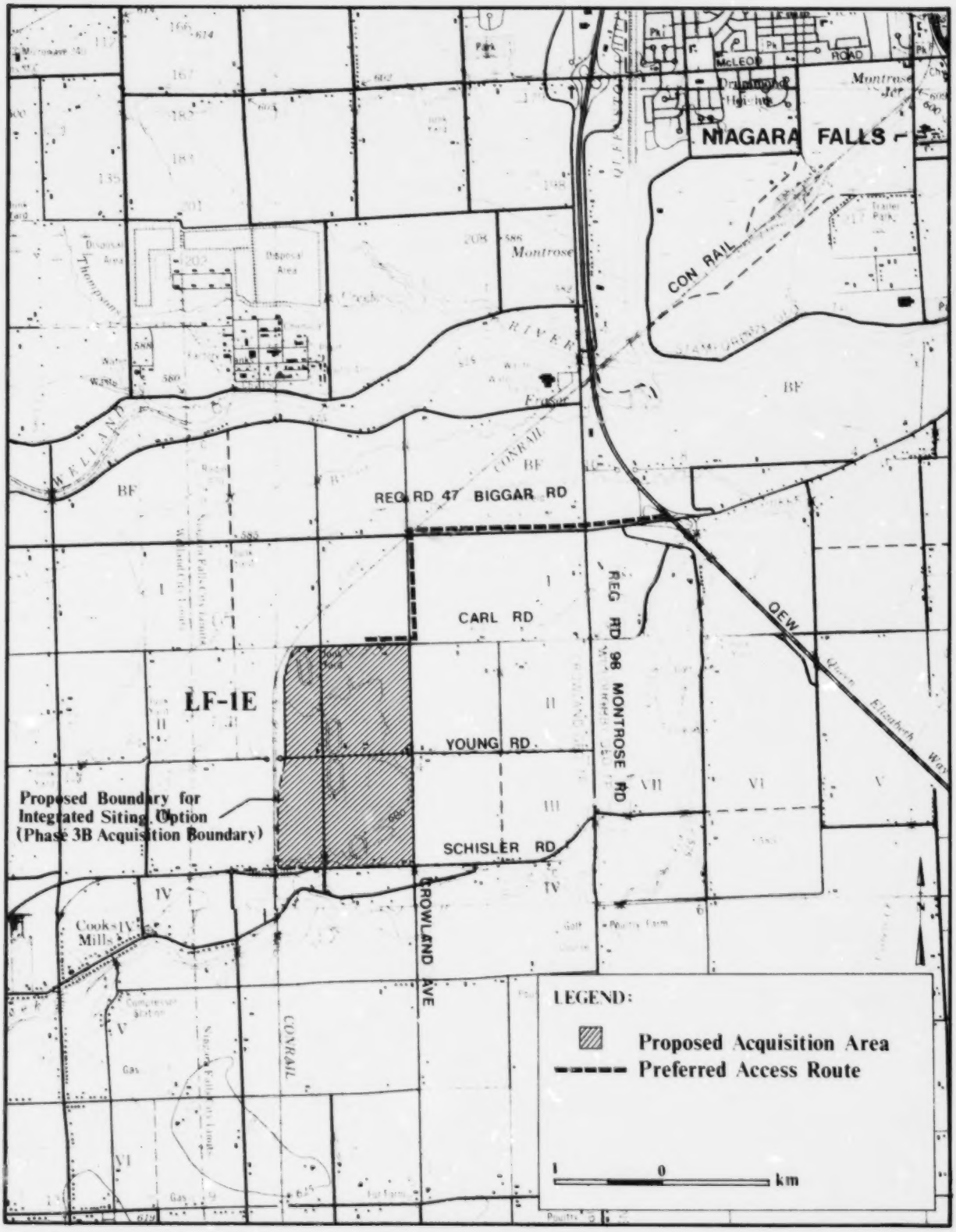
- LF-1E
- LF-1E/PI-27E
- LF-9C
- LF-3C
- LF-4N/PI-1N
- LF-4N/PI-13N

EXISTING ENVIRONMENT

DESCRIPTION OF OPTIONS

A system of alternatives emerged from the analysis on site boundary refinement, access roads, location of the physical/chemical treatment plant for partially integrated options and basic acceptability. Each of these is shown diagramatically on Figures 6-1 to 6-6. The preferred access roads and the locations of the landfill, incinerator and physical-chemical treatment facilities are defined for the siting options in Table 6-4.

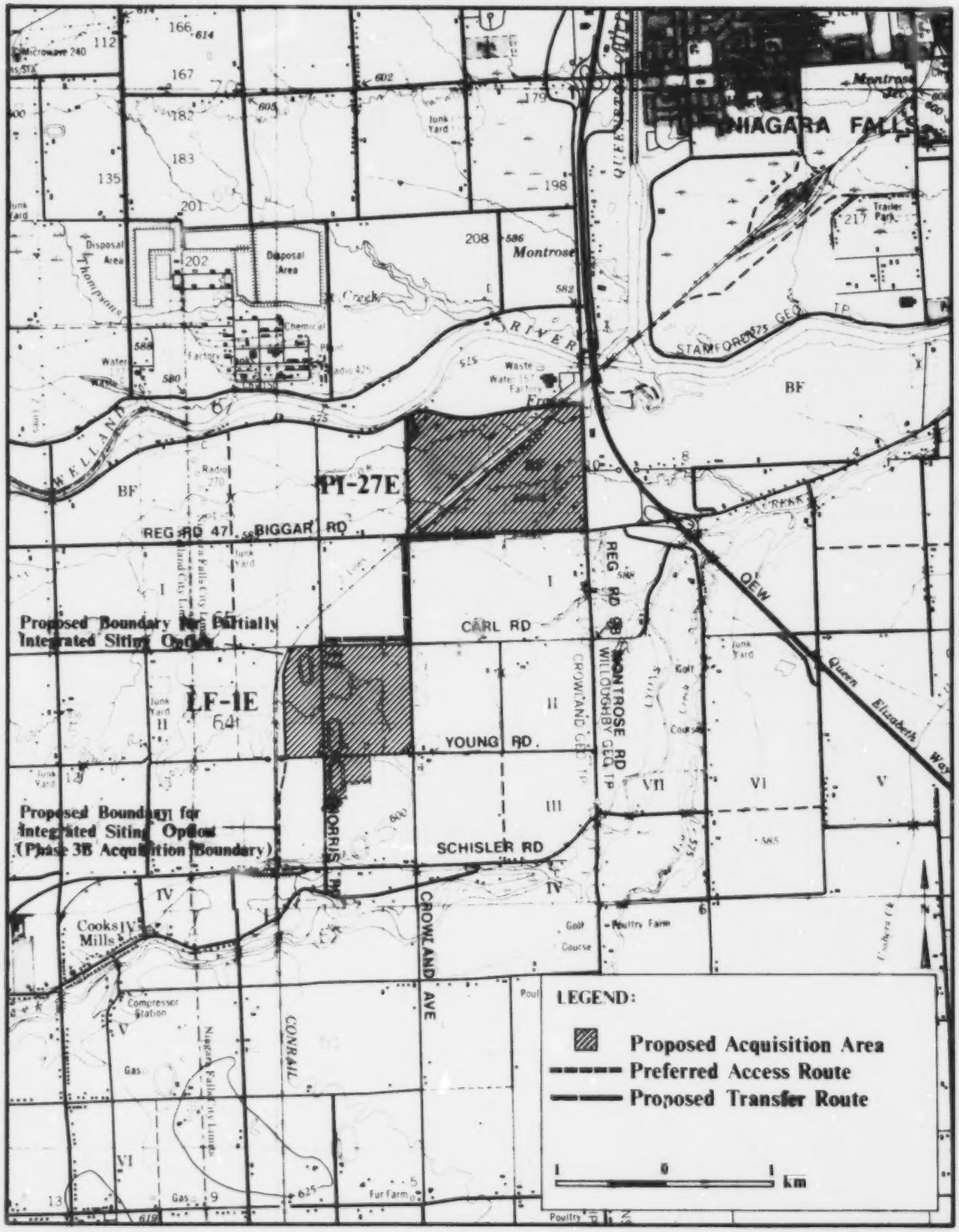
This section describes the general agricultural environment associated with each of the six final alternatives. For more detailed information about the existing environment of each of the siting options, see Appendix D. The following describes, for each siting option, the general agricultural character of the region and of the vicinity (local and regional), on-site characteristics and the nature of agriculture along the access roads.



LF-1E

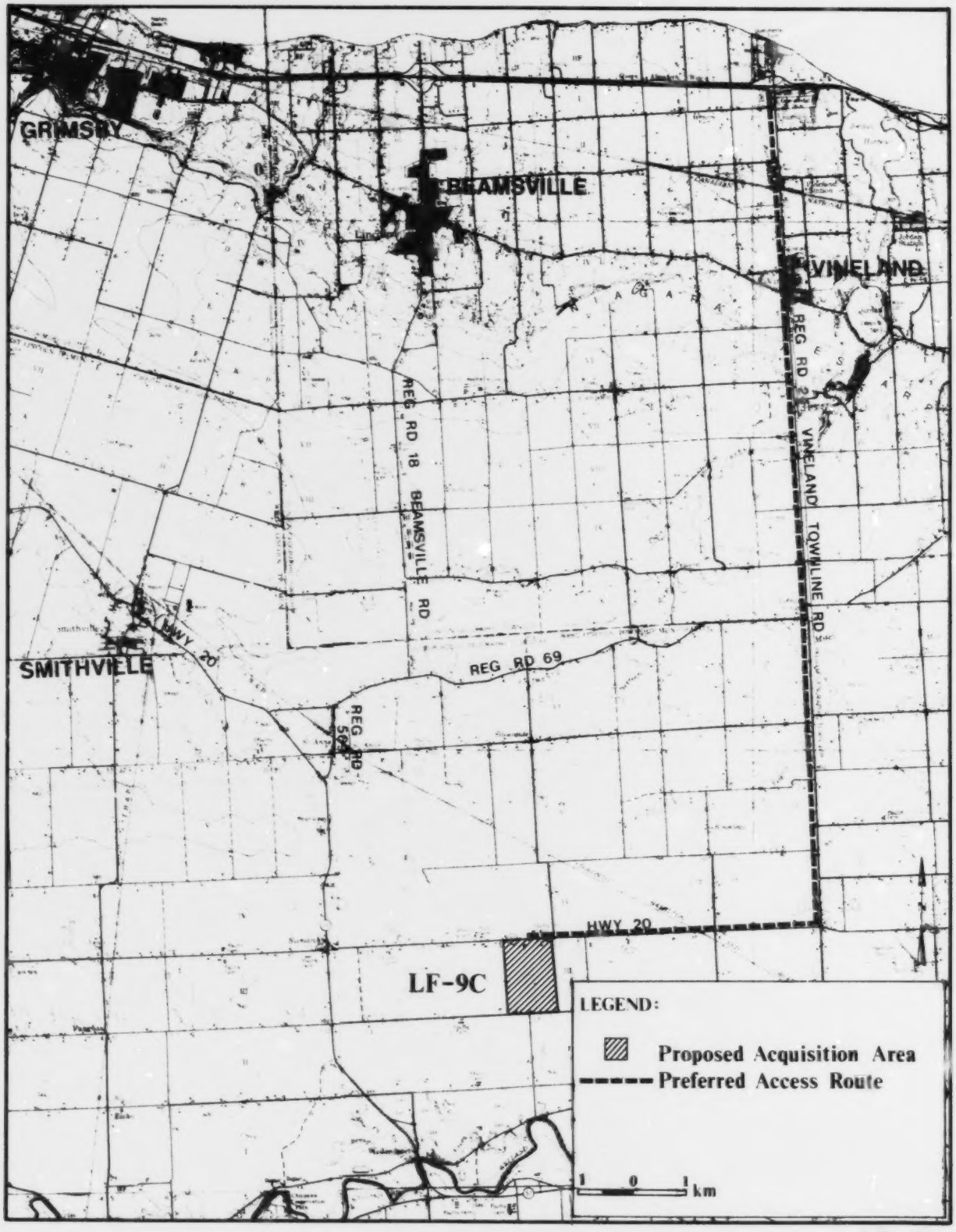
SITING OPTION

FIGURE 6-1



LF-1E/ PI-27E
PI-27E TO LF-1E
SITING OPTION

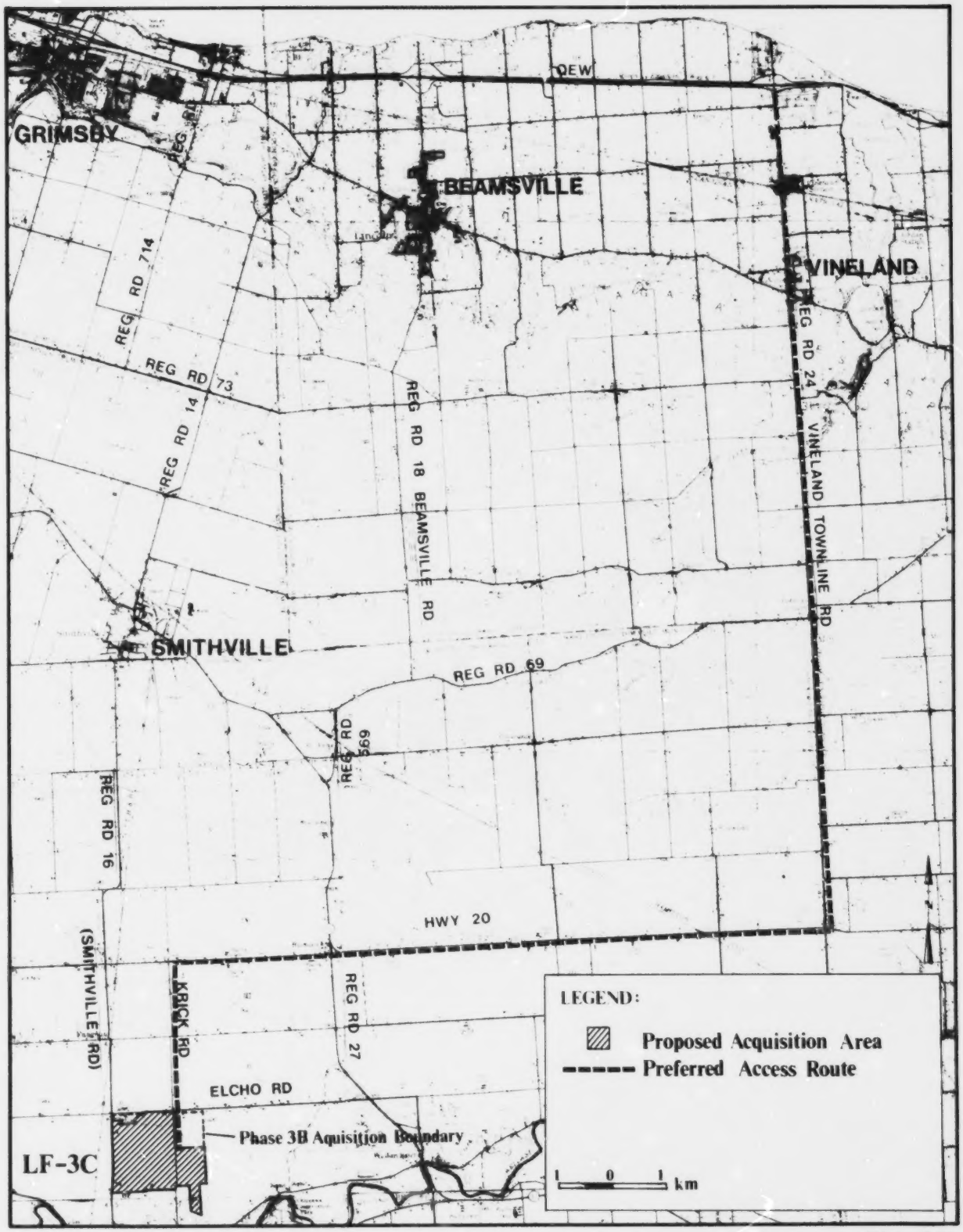
FIGURE 6-2



LF-9C

SITING OPTION

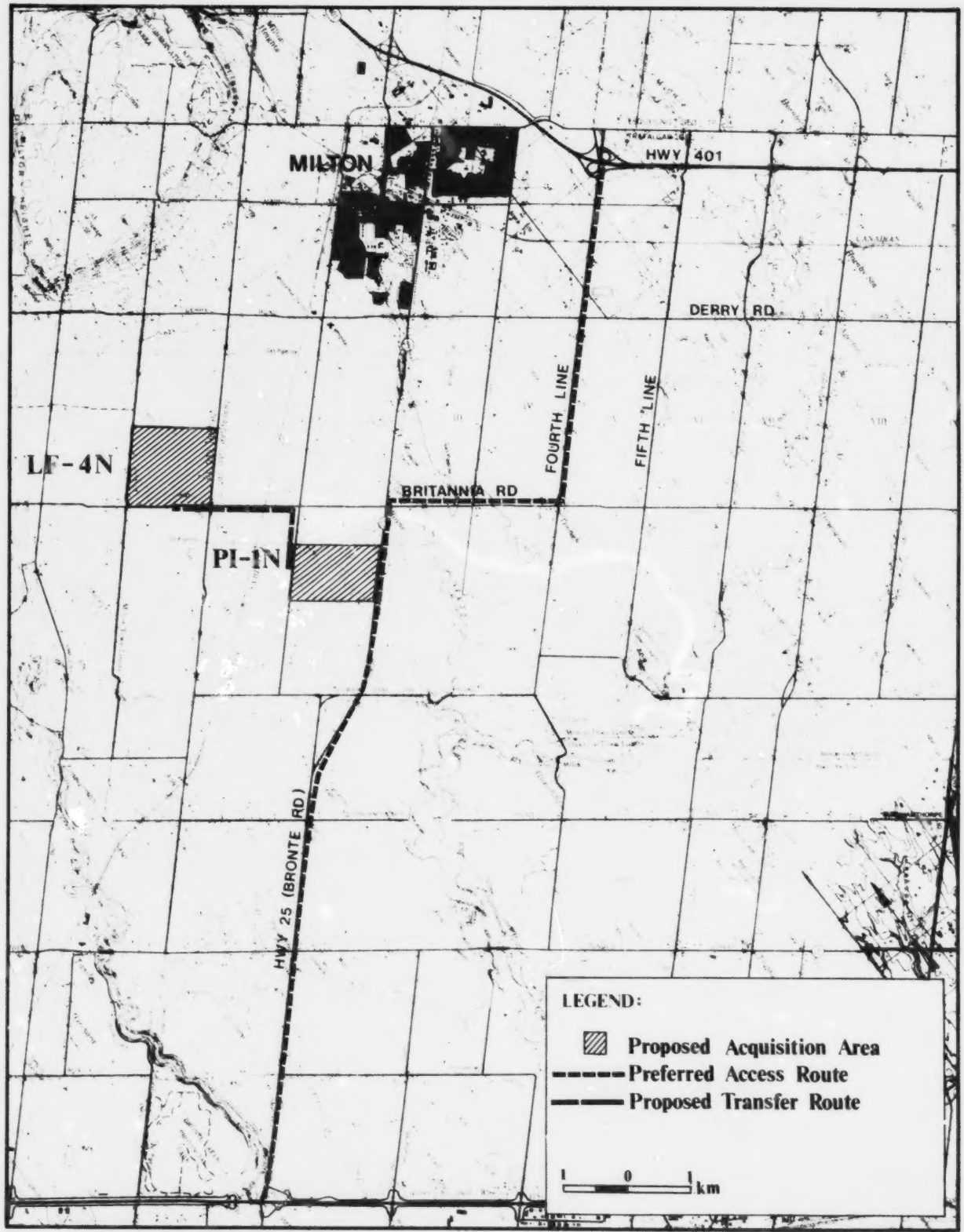
FIGURE 6-3



LF-3C

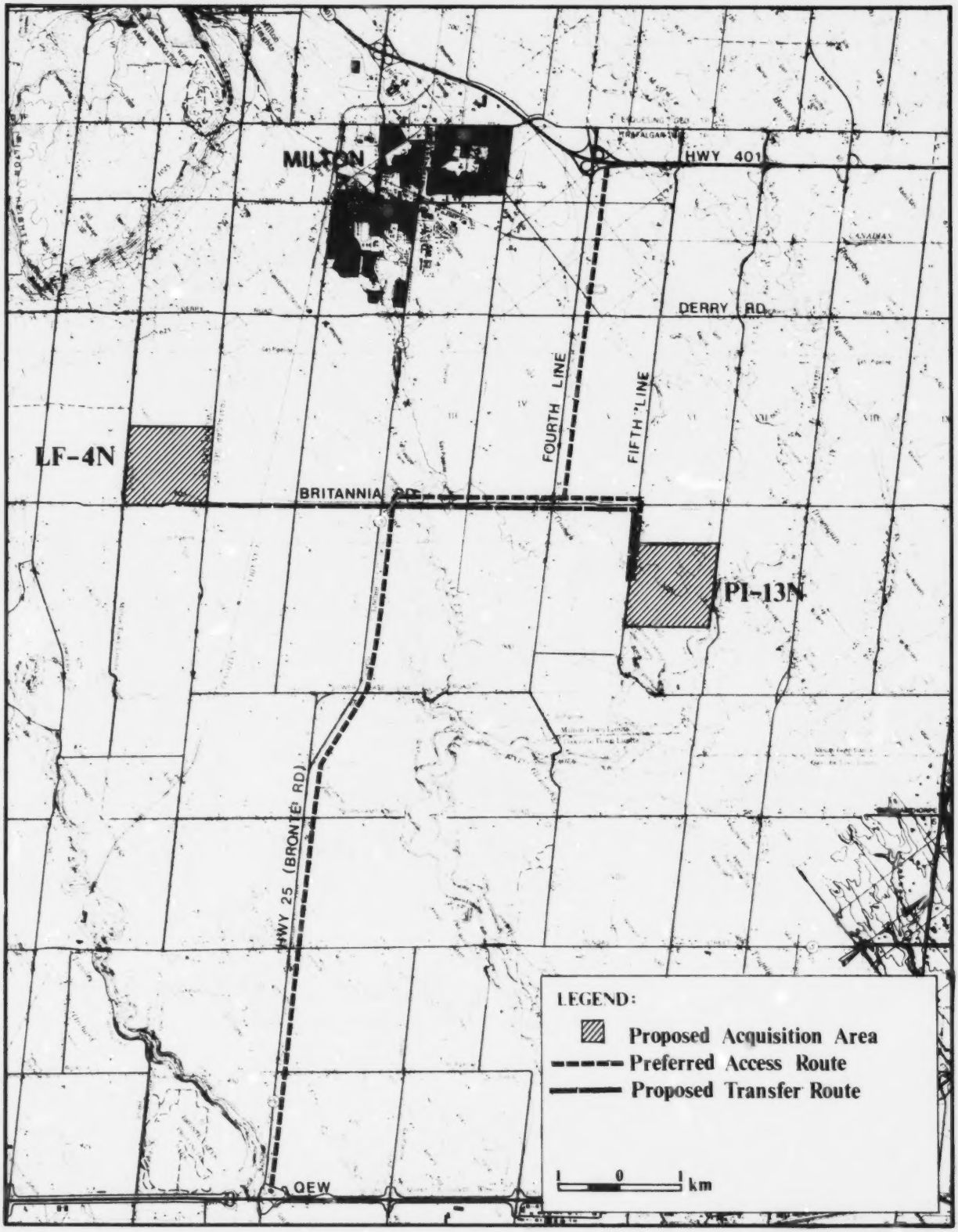
SITING OPTION

FIGURE 6-4



LF-4N /PI-1N TO LF-4N SITING OPTION

FIGURE 6-5



LF-4N/ PI-13N
PI-13N TO LF-4N
SITING OPTION

FIGURE 6-6

TABLE 6-4

PREFERRED ACCESS ROADS AND PARTIALLY INTEGRATED OPTIONS

SITING OPTION	ACCESS ROADS	FACILITIES
LF-1E	- From QEW, west on Biggar Road, south on Crowland Road, west on Carl Road to entry point	LF-1E - incinerator, physical/chemical treatment plant, landfill
LF-9C	- From QEW, south on Vineland Townline Road, west on Highway 20, south on Schram Road to LF-9C	LF-9C - incinerator, physical/chemical treatment plant, landfill
LF-3C	- From QEW, south on R.R. 24, west on Highway 20, west on R.R. 65 from Bismark, south on Krick Road to new entry point	LF-3C - incinerator, physical/chemical treatment plant, landfill
LF-4N/ PI-1N	- To PI-1N from 401, south on Fourth Line, west on Britannia Road south on Highway 25 - From QEW, north on Highway 25 to new entry point - Transfer - north on First Line, west on Britannia Road to LF-4N	LF-4N - landfill PI-1N - physical/chemical treatment plant, incinerator
LF-4N/ PI-13N	- To PI-13N from 401, south on Fourth Line, east on Britannia Road, south on Fifth Line - From QEW, north on Highway 25, east on Britannia Road, south on Fifth Line - Transfer - north on Fifth Line, west on Britannia Road	PI-13N - incinerator, physical/chemical treatment plant LF-4N - landfill
LF-1E/ PI-27E	- To PI-27E from QEW, west on Biggar Road to new entry point - Transfer - west on Biggar Road, south on Crowland Road, west on Carl Road to new 1E entry point	LF-1E - landfill PI-27E - physical/chemical treatment plant, incinerator

SITING OPTION LF-1E

Siting option LF-1E is located on the southern fringe of the Niagara Falls urban/industrial area. While agriculture is still quite evident, urbanization has had an obvious effect upon the area. Sixty-two percent of the land in the vicinity is farmed and, of that, only 39% is owned by farmers. There are many non-farm residences scattered throughout the vicinity and farm residences comprise only 17% of all rural residences. Farmers in the vicinity raise a small number of livestock, mainly beef cattle and pigs.

The on-site soils constitute 177 ha of Class 1 equivalents. There are seven farm headquarters on-site; however, the average size of farms is relatively small (27 ha). Two-thirds of the site lands are farmed and generate an estimated $37,000 per year of gross farm revenue.

The preferred access route to siting option LF-1E leads from the QEW, west on Biggar Road, south on Crowland Avenue and west on Carl Road to the entrance. Land along this route is mainly cash-cropped by local farmers and there is considerable equipment movement along Crowland Avenue.

SITING OPTION LF-1E/PI-27E

As discussed for siting option LF-1E, siting option LF-1E/PI-27E is located in an urbanizing area. The PI-27E site is situated on industrially designated land and is adjacent to a mix of heavy and light industry.

Roughly 60% of the land in the LF-1E/PI-27E vicinities are farmed; only 27% by owners. Only 16% of all farms operate full-time with pigs and poultry as the main livestock. There are many rural non-farm residences in the vicinities of both sites. Farm residences are only 15% of all rural residences.

The on-site lands have 91 ha of Class 1 equivalent soils. Since the on-site area of PI-27E is zoned industrial, the Class 1 equivalents (130 ha) are not included in the siting option comparison equivalent soils. (The implications of this are evaluated in the sensitivity analysis discussed later in this chapter.) Eighty-five percent of on-site lands are farmed. There are five on-site farm headquarters, all of which are owned but the average size of the farm operations is small, only 22 ha. About $26,000 per year of gross farm revenue is generated by the on-site farmland, the lowest of all siting options.

The access route to PI-27E from the QEW is a short section of Regional Road 47. None of the land along this section is farmed. Land adjacent to the transfer route (Regional Road 47 and Crowland Avenue) is mainly cash cropped by local farmers. Crowland Avenue is used frequently to move machinery between fields.

SITING OPTION LF-9C

Siting option LF-9C is located in West Lincoln Township. Agriculture in the area is stable, with little competition from urban or industrial uses.

Ninety-four percent of the land in the vicinity is farmed and there is a small percentage of rented farmland (24%). Most farmers are full-time operators and younger than age 55. There are few small land parcels and a low proportion of non-farm residences (42%). There is a mix of livestock in the area, with a high density of dairy, beef, pigs and poultry.

The site has 90 ha of Class 1 equivalent soils and almost all of the site is farmed. There are 2 farm headquarters on-site of moderately small average size (37 ha). There are few livestock, and hay is the main crop grown. The actively used on-site farmland generates an estimated $53,000 in gross farm revenues per year. However, the site also contains a 40 ha parcel which is tillable but was idle in 1984.

The preferred access route to siting option LF-9C is a long route, from the QEW, south on Vineland Townline Road and west on Highway 20. Agriculture along this route ranges from orchards and vineyards along the north half of Vineland Road, to a mix of cash crop, dairy and poultry farms along the southern half, and along Highway 20. Customer stops are relatively frequent and farm traffic along these routes is moderately heavy.

SITING OPTION LF-3C

Siting option LF-3C is also located in West Lincoln Township. As with siting option LF-9C, the community and agricultural land base are stable as there has been little urban/industrial encroachment.

Within the vicinity, 91% of the land is farmed. The land base has a few small land parcels and a small percentage of rented land (26%). Many farmers are full-time (57%) and most are less than age 55. Relatively few non-farm residences are located in the vicinity, of the total residences, 36% are farm. The proportion of farm residences in the vicinity would be high were it not for a concentration of rural non-farm residences in the extreme southwest corner of the vicinity. Dairy, hogs and poultry are the dominant livestock in the area.

The site has 135 ha of Class 1 equivalent soils. There are two farm headquarters on-site. They are on owned land and are the largest, on average, across the siting options. The on-site farmland generates an estimated $156,000 of gross farm revenue.

The preferred access route to siting option LF-3C is the same route to LF-9C, from the QEW south on R.R. 24, west on Highway 20 and then runs west on R.R. 65 from Bismark Road and south on Krick Road. The section along R.R. 65 passes mainly dairy and poultry farms. Along Krick Road, the land is owned by one dairy farm where cattle are moved along the road

during the grazing season. No farm headquarters are located along this road. There is a large amount of farm traffic on both of these roads.

SITING OPTION LF-4N/PI-1N

Siting option LF-4N/PI-1N is located in the Regional Municipality of Halton between the Town of Milton and City of Oakville. Although the land is largely rural, agriculture in Halton Region has been affected by urban land-use competition. Even though a high proportion of the vicinity lands are farmed (89%) and there are few small land parcels, there is a high percentage of rented land (68%) and non-farm residences (66%).

The sites have a total of 264 ha of Class 1 equivalent soils. Approximately 80% of the site lands are farmed. There are two owned headquarters on-site. This siting option is one of the two having the lowest average size of on-site farm operations (12 ha). An estimated $77,000 per year of gross farm revenue are generated by the site farmlands.

There are two routes to PI-1N from the 400 series highways; from the 401 south along the James Snow Parkway (Fourth Line Road), west on Brittania Road and south on Bronte Road; and from the QEW north on Bronte Road (Highway 25).

A section of Fourth Line has been upgraded to the James Snow Parkway. Adjacent fields are rented for cash crops. South of the Parkway, Fourth Line is of local standard and is used extensively for movement of farm equipment. There is a mix of beef and dairy farms and horse stables.

There are some beef, dairy and horse farms adjacent to this section of Brittania Road. There is a large amount of farm traffic, including customers (riders) travelling to the horse farm.

The transfer route between PI-1N and LF-4N is along First Line Road and Brittania Road. Most of the land along both routes is associated with a large beef and cash crop operation. There is a relatively large amount of farm traffic along this section of Brittania Road.

SITING OPTION LF-4N/PI-13N

Siting option LF-4N/PI-13N is located within the south-central part of Halton Region. Here, as at LF-4N/PI-1N, a high proportion of the vicinity lands are farmed (87%) and there are few small parcels of land. The effects of urban encroachment are shown by the high proportion of rented land (73%) and the high proportion of rural non-farm residences (72%). Just west of PI-13N along Trafalgar Road is a significant specialty crop production area.

This siting option has a total of 261 ha of Class 1 equivalents. Most of the PI-13N site is owned by the Ontario Land Corporation (91%) and is rented to farmers. In total, there are four headquarters on-site, two owned and two leased. Those owned average 12 ha in size. On-site farmlands generate an estimated $177,000 of gross farm revenue per year.

The access routes to PI-13N are similar to the LF-4N/PI-1N siting option, extending from the 401 along fourth line, Brittania Road and Fifth Line; and from the QEW on Bronte Road, Brittania Road and the Fifth Line. The section of Brittania Road not described in the LF-4N/PI-1N siting option passes two beef farms and is heavily used by farm vehicles in the area. There are two large dairy farms along the Fifth Line.

The transfer route between PI-3N and LF-4N is along the Fifth Line and Brittania Road.

DATA ON SITING OPTIONS FOR COMPARATIVE ANALYSIS

The data collected, following the procedures outlined in the foregoing section, have been assembled in a data matrix (Table 6-5) for each siting option. This table enables one to compare the data values for each indicator and sub-indicator across the siting options. The application of these data in the comparison of siting options is discussed in the following sections.

SCREENING AND MODIFICATIONS TO FACTORS AND INDICATORS

At the end of Phase 3B, a number of potential factors and indicators were identified for consideration in Phase 4A. Once the detailed Phase 4A data collection and analysis were completed, it was concluded that potential impacts could be better identified through a reworking of the preliminary factors and indicators. Also, it was found that some indicators tended to be redundant. The changes introduced and reasons for these are listed in Table 6-6.

RANKING AND AGGREGATION OF FACTORS AND INDICATORS

The purpose of this section is to describe the procedures used to rank indicators and factors and to arrive at a ranking of siting options from an agricultural perspective. Because of the large number of sub-indicators, indicators and factors, a sequential process of rating was adopted as illustrated below.

TABLE 6-5

DETAILED COMPARATIVE EVALUATION OF SITING OPTIONS

STUDY AREA FACTOR INDICATOR	LF-1E	LF-1E PI-27E	LF-9C	LF-3C	LF-4N PI-1N	LF-4N PI-13N
SITE:						
- Displacement of Farms with On-Site Headquarters						
- No. of farm operations						
- owned	7	5	2	2	2	2
- rented	0	0	0	0	0	2
- Ave farm size (ha)						
- owned	27	22	37	65	12	12
- rented	0	0	0	0	0	101
- Gross farm revenue ($ 000's)	36.8	26.0	53.0	156.0	77.0	177.3
- Loss of Farmland						
- Soil capability (Class 1 equiv.)	177	91	90	135	264	261
- Tile drainage (ha)	0	0	19	57	0	0
VICINITY:						
- Partial Displacement of Farms (off-site farms with on-site land)						
- No. of farms affected	2	2	1	3	5	1
- Average parcel size (ha)	20	13	20	47	50	79
- Proportion of land base lost (%)						
- owned	25	25	16	18	0	0
- rented	35	11	0	32	15	15
- Disruption of Adjacent Farm Operations						
- No. of farms with headquarters	3	4	6	5	5	8
- No. of operators with owned land	5	7	8	10	8	11
- Livestock density (animal units/ha)	0.26	0.27	1.14	0.32	0.40	0.54
-Disruption of Non-Adjacent Vicinity Operations						
- No. of farms with headquarters	23	23	23	32	16	19
- Prop. of non-adjacent vicinity in crops (%)	41	22	71	61	67	66
- Livestock density (animal units/ha)	0.25	0.25	2.44	1.09	0.45	0.28
COMMUNITY:						
- Stability of Farm Population						
- Operator age (% < 55)	65	64	75	75	62	58
- Full time operators (% of total operators)	16	16	60	52	56	49
- Stability of Land Base						
- Tenure						
- large parcels (% of land in parcels > 12.6 ha)	53	51	91	82	82	81
- owned farmland (% of total)	39	27	76	74	32	27
- area farmed (% of total)	62	51	94	91	89	87
- Farm residences as % of total residences	17	15	58	36	34	28
- Agriculturally designated land (Class 1 equiv.)	72	50	69	70	87	84
- Private land ownership (% of total)	99	97	100	98	100	88

TABLE 6-5 - cont'd

COMPARATIVE EVALUATION OF SITING OPTIONS

STUDY AREA FACTOR INDICATOR	LF-1E	LF-1E PI-27E	LF-9C	LF-3C	LF-4N PI-1N	LF-4N PI-13N
REGION:						
- Disruption to the Farm Economy						
- Gross farm revenue ($ M, 1981)	2.0	2.5	8.6	6.9	6.4	16.3
- Relative exposure to fugitive emissions						
- livestock index (M)	1.39	0.29	4.41	1.87	1.19	3.94
- crop index (M)	0.01	0.00	0.01	0.01	0.21	0.47
- Relative exposure to stack emissions						
- livestock index (M)	0.15	0.11	0.48	0.63	0.12	0.12
- crop index (M)	0.06	0.06	0.23	0.10	0.04	0.04
- Downstream livestock	3	3	8	11	2	1
ACCESS ROADS:						
- Disruption to Farm Traffic & Cattle Crossings						
- Local roads						
- agricultural vehicle impact index ('000)	0.12	0.12	0.00	9.10	10.00	12.15
- no. customer/service vehicle stops ('000)	0.00	0.00	0.00	0.00	5.50	12.05
- cattle crossings	0	0	0	517	10	10
- Regional roads						
- agricultural vehicle impact index ('000)	0.03	0.00	36.40	85.40	10.60	10.60
- no. customer/service vehicle stops ('000)	0.00	0.00	35.30	36.80	6.00	5.70
- cattle crossings	0	0	0	0	0	0
- Disruption to Crop & Livestock Production						
- Adjacent crops ('000 ha)	0.34	0.40	2.36	3.60	2.60	3.54
- Adjacent livestock (# of animal units('000))	0.05	0.00	1.73	7.84	0.89	1.34
- Downstream livestock	0	0	32	48	7	5

TABLE 6-6

CHANGE IN PRELIMINARY FACTORS/INDICATORS

PRELIMINARY PHASE 4A FACTORS FACTOR GROUPING/FACTOR INDICATOR	MODIFIED PHASE 4A FACTORS FACTOR GROUPING/FACTOR INDICATOR	SCREENED*	ADDITION	MODIFICATION	COMMENTS
AGRICULTURAL RESOURCES					
1. Displacement of existing farm businesses and farm property	1. Displacement of farms with on-site headquarters			x	. wording change to more accurately reflect meaning of factor
. number and average size of farm businesses	. number of farms			x	. previous indicator split into two indicators
	. average size of farms			x	. see above
. tillable hectares		x			. redundant with "average farm size" indicators
	. estimated gross farm revenue		x		. indicates relative loss of revenue to community from displaced on-site farmland
2. Displacement of prime agricultural land	2. Loss of farmland				. no change
. soil capability (including climate considerations)	. soil capability				. no change
. tile drainage	. tile drainage				. no change
. land losses due to road improvements		x			. differences among options were very minor
	Vicinity				
3. Operations of existing farm businesses	3. Partial displacement of farms (farms with off-site headquarters losing on-site land)			x	. factors and indicators expanded to provide a more detailed level of information by study area (see modified Factors 3-5)
. number and average size of existing farm operations	. number of operations affected			x	. wording change
	. average parcel size			x	. more accurate assessment of degree of impact to farms losing land
. crop and livestock uses	. proportion of land base lost			x	. see above

TABLE 6-6 - cont'd

CHANGE IN PRELIMINARY FACTORS/INDICATORS

PRELIMINARY PHASE 4A FACTORS FACTOR GROUPING/FACTOR INDICATOR	MODIFIED PHASE 4A FACTORS FACTOR GROUPING/FACTOR INDICATOR	SCREENED*	ADDITION	MODIFICATION	COMMENTS
	4. Disruption of adjacent farm operations			x	. factors and indicators expanded to provide a more detailed level of information by study area
	. number of farms with headquarters			x	. wording change
	. number of operators with owned land		x		. gives more accurate assessment of relative potential for farm property value impacts
. crop and livestock density	. livestock density			x	. more accurate measure of livestock use for comparative purposes
	5. Disruption of non-adjacent farm operations			x	. factors and indicators expanded to provide a more detailed level of information by study area
	. number of farms with headquarters			x	. wording change
	. proportion of land in crops			x	. better describes extent to which the vicinity area is actively used for agriculture
	. livestock density			x	. more accurate measure of crop and livestock use for comparative purposes
	Access Roads				
3. Operations of existing farm businesses	6. Disruption to farm traffic and cattle crossings			x	. farm traffic and cattle crossings considered under new factor
. farm related traffic movements	. local roads			x	. see above
. frequency of cattle crossings	. regional roads and Provincial Highways			x	. see above

TABLE 6-6 - cont'd

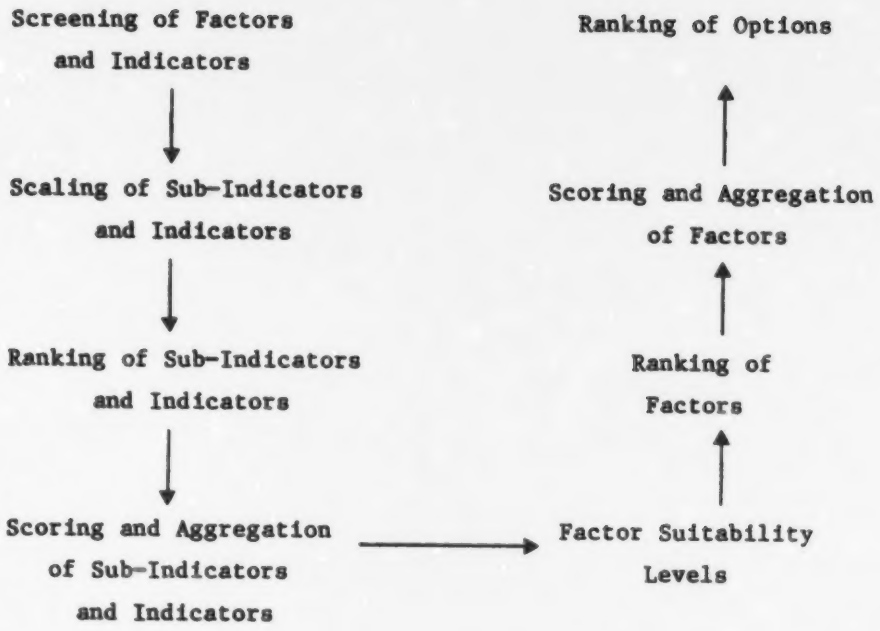
CHANGE IN PRELIMINARY FACTORS/INDICATORS

PRELIMINARY PHASE 4A FACTORS FACTOR GROUPING/FACTOR INDICATOR	MODIFIED PHASE 4A FACTORS FACTOR GROUPING/FACTOR INDICATOR	SCREENED*	ADDITION	MODIFICATION	COMMENTS
	7. Disruption to crop and livestock production		x		. provides additional measure of potential disruption
	. adjacent crops		x		. provides additional measure of potential disruption
	. adjacent livestock		x		. see above
	. downstream livestock		x		. see above
	Community and Region				
4. Agricultural Community	8. Stability of farm population			x	. separates indicators from land base-related indicators and allows for differential weighting
. number and characteristics of farm families	. age of operators			x	. more specific measure of farm operator characteristics
	. full-time operators (as percent of total operators)			x	. more specific measure of farm operator characteristics
	9. Stability of land base				
. land fragmentation/ ownership	. land tenure			x	. new indicator provides added measure of ownership
	. farm residences (as percent of total residences)			x	. separates farm ownership from the above indicator
	. agriculturally designated land (as Class 1 equivalents)			x	. indicators for "planned and proposed land uses" grouped under more explicit factor in appropriate study area, i.e. "Community"
	. private land ownership			x	. indicators for "planned and proposed land uses" grouped under more explicit factor in appropriate study area, i.e. "Community"

TABLE 6-6 - cont'd

CHANGE IN PRELIMINARY FACTORS/INDICATORS

PRELIMINARY PHASE 4A FACTORS FACTOR GROUPING/FACTOR INDICATOR	MODIFIED PHASE 4A FACTORS FACTOR GROUPING/FACTOR INDICATOR	SCREENED*	ADDITION	MODIFICATION	COMMENTS
	10. Disruption to farm economy			x	. modified to specifically address concerns at a regional level
	. gross farm revenue			x	. indicates relative potential for impact to the regional agricultural economy
	. relative exposure of crops and livestock to stack emissions			x	. economic impacts assessed
	. relative exposure of crops and livestock to fugitive emissions			x	. economic impacts assessed
	. exposure of downstream livestock			x	. economic impacts assessed
5. Planned and proposed agricultural uses				x	. factor now forms part of Land Use Factors
					. see also stability of farm population factor
. land use plans of public land owners				x	. see above
. land use designations and policies				x	. see above


Screening of Factors and Indicators
Scaling of Sub-Indicators and Indicators
Ranking of Sub-Indicators and Indicators
Scoring and Aggregation of Sub-Indicators and Indicators
Factor Suitability Levels
Ranking of Factors
Scoring and Aggregation of Factors
Ranking of Options

A set of criteria were developed by the site selection consultants to provide consistency in assigning ratings. These principles are outlined below.

1. Potential for Impacts - Factors which possessed a strong likelihood for the occurrence of an impact were ranked more highly. With some factors the likelihood of impacts occurring are relatively remote. For example, the transportation analysis indicated that the likelihood for spills is extremely remote. The likelihood of spills into watercourses that would damage downstream livestock is even more remote. In these instances the factors would not be ranked as highly. With other factors such as the displacement of farm operations, impacts are certain and from this perspective warrant a relatively high ranking.

2. Severity of Impacts - Factors which represent a potential for severe impacts were ranked more highly. With some factors, the severity of potential impacts are either quite low for all siting options or they represent a very minor change from existing or anticipated conditions. Such is the case, for example, with potential disruption to crop and livestock production adjacent to access roads. Because the risk of an accidental spill of hazardous materials is very low and only a small area would be affected the factor would not be ranked highly.

   Alternatively, with the farms adjacent to a site, impacts could be quite severe as a result of property value depreciation, noise, dust and traffic. In this case the factor would be ranked highly.

3. Public Policy - Factors were ranked more highly if there is a potential conflict with provincial or municipal policies. An example of this would be prime farmland which is the subject of concern of the provincial "Foodland Guidelines."

4. Significance - More significant factors were ranked more highly. Significance pertains to the relative importance of a feature or resource within the region or community. Significance encompasses such considerations as rarity, sensitivity to change, and major concerns of agencies or the community.

5. Frequency/Duration - Factors representing the potential for high frequency or long duration of impacts were ranked more highly.

   With some factors, impact occur very briefly or very occasionally such as construction noise and dust. With other factors, impacts will occur over the operating life of the facility. Such is the case for farms adjacent to the site. In other cases, such as the displacement of farmland, the impact represents a permanent resource loss.

6. Connections to Other Factors - Factors highly connected to other factors are ranked more highly than factors which are relatively independent. With some factors, such as the loss of on-site farm operations, impacts are not likely to result in secondary consequences and therefore, would be ranked less highly. A major adverse impact on the farm economy could have a wider range of social, economic and land use repercussions and would, therefore, tend to be ranked more highly.

7. Uncertainty - Factors are ranked more highly where they have the potential for serious unanticipated impacts. With some factors, such as the loss of prime farmland, potential impacts are well understood and the magnitude of potential impacts can be predicted with a considerable degree of accuracy.

   With other factors, such as the regional farm economy, impact predictions tend to be less precise. Such predictions are dependent on external considerations which can either not be controlled or which may change during the construction or operations phases. Thus, land value changes in the vicinity of some sites may either be short term and moderate or they may be long term and severe. As in such cases there is the potential for serious unanticipated impacts the factors would tend to be ranked more highly.

   This ranking consideration takes into account these differences in the level of confidence associated with impact predictions for different factors.

8. Mitigation - Non-mitigative factors have been ranked more highly. With some factors potential impacts can be more readily mitigated. Such is the case for the exposure of crops and livestock along access roads. With other factors such as land value changes, there is only the potential for mitigation. With still other factors, such as the loss of farmland mitigation is not possible.

INDICATOR SCALING

Indicator scaling was carried out utilizing the procedure described in Chapter 3. The data in Table 6-5 were first converted to a relative scale of 0 to 100. This was accomplished by assigning a value of 100 to the matrix cell which recorded the largest value for an indicator or sub-indicator. The comparable data values for other siting options for that indicator or sub-indicator were calculated as a percentage of the largest data value.

In the case of tile drainage where only two sites are affected, the amount of tile drainage per site was taken as a percentage of the Class 1 equivalents to obtain the scaled values.

The scaled data are presented in Table 6-7. The differences in values among siting options for any indicator or sub-indicator can readily be assessed on a percentage basis by comparing the values in this table.

INDICATOR RANKING

The next step was a ranking of sub-indicators and indicators. The purpose was to establish the relative importance of individual sub-indicators and indicators to each factor and to provide a means of aggregating indicators within factors. A rank is represented by numeric value and is multiplied by a numeric value in the scaling matrix (Table 6-7). Unlike scaling values which vary from one siting option to the next, the ranking is constant across siting options. It signifies the relative importance of an indicator and not the magnitude of impacts.

Each indicator was assigned a rank from 1 to 5. Sub-indicators were given a 1 to 3 ranking. Tables 6-8 and 6-9 give the ranking of sub-indicator and indicator, and the rationale for each.

TABLE 6-7

SCALING OF INDICATORS AND SUB-INDICATORS

STUDY AREA FACTOR INDICATOR	LF-1E	LF-1E PI-27E	LF-9C	LF-3C	LF-4N PI-1N	LF-4N PI-13N
SITE:						
- Displacement of Farms with On-Site Headquarters						
- No. of farm operations						
- owned	100	71	29	29	29	29
- rented	0	0	0	0	0	29
- Ave farm size (ha)						
- owned	27	22	37	65	12	12
- rented	0	0	0	0	0	100
- Gross farm revenue ($ 000's)	21	15	30	88	43	100
- Loss of Farmland						
- Soil capability (Class 1 equiv.)	67	35	34	51	100	99
- Tile drainage (ha)	0	0	21	42	0	0
VICINITY:						
- Partial Displacement of Farms (off-site farms with on-site land)						
- No. of farms affected	40	40	20	60	100	20
- Average parcel size (ha)	25	17	25	60	63	100
- Proportion of land base lost (%)						
- owned	71	71	46	51	0	0
- rented	100	31	0	91	43	43
- Disruption of Adjacent Farm Operations						
- No. of farms with headquarters	38	50	75	63	63	100
- No. of operators with owned land	46	64	73	91	73	100
- Livestock density (animal units/ha)	23	24	100	28	35	47
-Disruption of Non-Adjacent Vicinity Operations						
- No. of farms with headquarters	72	72	72	100	50	59
- Prop. of non-adjacent vicinity in crops (%)	58	31	100	86	94	93
- Livestock density (animal units/ha)	10	10	100	45	18	11
COMMUNITY:						
- Stability of Farm Population						
- Operator age (% < 55)	87	85	100	100	83	77
- Full time operators (% of total operators)	27	27	100	87	93	82
- Stability of Land Base						
- Tenure						
- large parcels (% of land in parcels > 12.6 ha)	58	56	100	90	90	89
- owned farmland (% of total)	51	36	100	97	42	36
- area farmed (% of total)	66	54	100	97	95	93
- Farm residences as % of total residences	29	26	100	62	59	48
- Agriculturally designated land (Class 1 equiv.)	83	57	79	80	100	94
- Private land ownership (% of total)	99	97	100	98	100	88

TABLE 6-7 - cont'd

SCALING OF INDICATORS AND SUB-INDICATORS

STUDY AREA FACTOR INDICATOR	LF-1E	LF-1E PI-27E	LF-9C	LF-3C	LF-4N PI-1N	LF-4N PI-13N
REGION:						
- Disruption to the Farm Economy						
- Gross farm revenue ($ M, 1981)	12	15	53	42	39	100
- Relative exposure to fugitive emissions						
- livestock index (M)	10	2	31	13	100	28
- crop index (M)	3	0	2	1	46	100
- Relative exposure to stack emissions						
- livestock index (M)	24	18	76	100	19	19
- crop index (M)	28	25	100	45	16	17
- Downstream livestock	27	27	73	100	18	9
ACCESS ROADS:						
- Disruption to Farm Traffic & Cattle Crossings						
- Local roads						
- agricultural vehicle impact index ('000)	1.3	1.3	0	75	82	100
- no. customer/service vehicle stops ('000)	0	0	0	0	45	100
- cattle crossings	0	0	0	100	2	2
- Regional roads						
- agricultural vehicle impact index ('000)	0	0	43	100	12	12
- no. customer/service vehicle stops ('000)	0	0	96	100	16	15
- cattle crossings	0	0	0	0	0	0
- Disruption to Crop & Livestock Production						
- Adjacent crops ('000 ha)	9	11	66	100	72	98
- Adjacent livestock (# of animal units('000))	1	0	22	100	11	17
- Downstream livestock	0	0	67	100	15	10

TABLE 6-8

SUB-INDICATOR WEIGHTS AND RATIONALE

FACTOR	INDICATOR	SUB-INDICATOR	WEIGHT	RATIONALE
Displacement of Farms with On-Site Headquarters	No. of farms with on-site headquarters	. No. owned	3	. ownership indicates a significant degree of commitment to the land-base of an operation and a considerable degree of long-term control over land-use
		. No. rented	1	. no long-term commitment is necessarily implied when land is rented
	Average farm size (ha)	. No. owned	3	. ownership indicates a significant degree of commitment to the land-base of an operation and a considerable degree of long-term control over land-use
		. No. rented	1	. no long-term commitment is necessarily implied when land is rented
Partial Displacement of Farms in Vicintiy (off-site farms with on-site land)	Proportion of land base lost (%)	. Proportion owned	3	. ownership indicates a significant degree of commitment to the land-base of an operation and a considerable degree of long-term control over land-use
		. Proportion rented	1	. no long-term commitment is necessarily implied when land is rented
Stability of Land Base in the Community	Land tenure	. Proportion in large parcels (>12.6 ha)	1	. larger properties are conducive to efficient farming though the overall farm size is more significant in this regard
		. Proportion held by owner	3	. owned farm land imparts greater stability to an agricultural community
		. Proportion farmed	1	. the predominance of agricultural land uses is a significant measure of the integrity of an agricultural community
Disruption to the Farm Economy in the Region	Relative exposure of crops and livestock to fugitive emissions	. Livestock index	1	. these sub-indicators are proxy measures of the impact on crops and livestock. The actual extent or nature of the impact is not known; nor is the relative importance of the type of emission
		. Crop index	1	
	Relative exposure of crops and livestock to stack emissions	. Livestock index	1	
		. Crop index	1	
Disruption to Farm Traffic and Cattle Crossings along Access Roads	Local roads	. Agricultural vehicle impact index	3	. the potential for disruption and/or accident with farm vehicles is higher since the vehicles are slow and often cumbersome
		. No. of customer and service vehicle stops	2	. customer and service vehicles travel at full speed. Disruption will occur only when these vehicles are approaching or leaving farms
		. Cattle crossings	1	. risk of accident is significant but risk can be greatly minimized through mitigation
	Regional Roads	. Agricultural vehicle impact index	3	. the potential for disurption and/or accident with farm vehicles is higher since the vehicles are slow and often cumbersome
		. No. of customer and service vehicle stops	2	. customer and service vehicles travel at full speed. Disruption will occur only when these vehicles are approaching or leaving farms
		. Cattle crossings	1	. risk of accident is significant but risk can be greatly minimized through mitigation

TABLE 6-9

RATIONALE FOR RANKING OF INDICATORS

FACTOR	INDICATOR	RANK	RATIONALE
Displacement of Farms with On-Site Headquarters	. No. of Farm Operations with On-Site Headquarters	5	means as loss of operators and their families
	. Average Farm Size	5	commercial significance is indirectly related to size
	. Estimated Gross Farm Revenue	4	expresses intensity of agricultural use of on-site lands
Loss of Farmland	. Soil Capability	5	loss of resource to agricultural sector and to society
	. Tile Drainage	3	investment in overcoming soil drainage limitations
Partial Displacement of Farms in Vicinity	. No. of Farms Operations Affected	4	provides a direct measure of off-site farms with on-site land affected
	. Average Size of Lost Parcels	3	larger sizes indicate potentially more viable operations affected
	. Proportion of Land Base Lost	5	indicates degree of loss of business and assets
Disruption of Adjacent Farm Operations	. No. of Farms with Headquarters	5	provides a direct measure of impacted operators
	. No. of Operations with Owned Land	4	owned land signifies a closer attachment to the land base; accounts for possible land value decline
	. Livestock Density	3	reflects presence of operations with high investments in relatively immobile assets
Disruption of Non-Adjacent Farm Operations	. No. of Farms with Headquarters	5	provide a direct measure of potentially impacted operators
	. Proportion of Land in Crops	4	a measure of intensity of use of agricultural land
	. Livestock Density	3	reflects presence of operations with high investments in relatively immobile assets
Stability of Farm Population	. Age of Operators (% <55 Years Old)	3	indirect indicator of vulnerability of operator to impact
	. Full-Time Operators (% of Total Operators)	4	measure of predominance of commercial agricultural operators
Stability of Agricultural Land Base	. Land Tenure	5	a good measure of stability of agricultural land base
	. Farm Residences (% of Total Residences)	4	measures predominance of agriculture in the local population
	. Agriculturally Designated Land (Class 1 Equivalents)	4	indicates protection of agricultural land from urban encroachment
	. Private Land Ownership	3	reflects long-term prospects for agricultural land use
Disruption to the Farm Economy in the Region	. Gross Farm Revenue	5	good summary measure of farming activity at risk
	. Relative Crop and Livestock Exposure to Fugitive Emissions	4	exposure levels expected to be low but involve untreated waste products
	. Relative Crop and Livestock Exposure to Stack Emissions	3	exposure levels expected to be low but emissions are treatment byproducts
	. Exposure of Downstream Livestock	3	measures impact on livestock downstream from potential accidental spills into water courses
Disruption to Farm Traffic Along Access Roads	. Local Roads	5	potentially high interference with farm vehicle movements and cattle crossings
	. Regional Roads	3	O.W.M.C. traffic joins already significant traffic movements on regional roads
Disruption to Crop and Livestock Production Along Access Roads	. Adjacent Crops	3	crop damage due to spills is relatively short-term (1 year)
	. Adjacent Livestock	4	risk to higher value assets concentrated in small areas
	. Downstream Livestock	5	measures impact on livestock downstream from any potential accidental spills into water courses

INDICATOR SCORING AND AGGREGATION

Ranked values were multiplied by the scaled values for sub-indicators and indicators to give ranked indicator scores. The procedure for these calculations is outlined in Appendix G along with the matrix of scores. An aggregate indicator score was then determined by summing the indicator scores under each factor.

FACTOR SUITABILITY LEVELS

Once aggregate scores for indicators were determined, it was possible to calculate factor suitability levels. Factor suitability levels were ordered on a scale of 0 to 5.0 to demonstrate relative differences among siting options for each factor. A low value means that a siting option would experience relatively low impact for a particular factor whereas a high value means that the impact would be relatively high.

The procedure for calculating factor suitability levels is explained in Appendix G. It was arrived at by scaling the indicator totals for each factor and dividing these by 20 to convert the scaled values to a 0-5 scale. Table 6-10 lists the factor suitability ratings for the siting options.

FACTOR RANKING

Since not all factors can be considered equally important in light of differences in the significance of those factors, it was necessary to establish relative weights (ranking) for the factors.

TABLE 6-10

FACTOR SUITABILITY LEVELS

LF-1E

FACTOR	SUITABILITY LEVEL	RATIONALE
Displacement of Farms with On-Site Headquarters	-3.9	- there are many operations with headquarters, all of which are owner-operated, but with a relatively small average size - the estimated gross farm revenue is moderately low
Loss of Farmland	-3.4	- there is no tile drained land on site, and the Class 1 land equivalent rating is moderate
Partial Displacement of Farms in Vicinity	-4.3	- there are moderately few small headquarter farms in the vicinity losing on-site land, but the proportion of the land base lost is moderately-high
Disruption of Adjacent Farm Operations	-2.1	- number of farms with headquarters, number of operators with owned land, and livestock density are moderately-low
Disruption of Non-Adjacent Vicinity Operations	-2.9	- number of headquarter farms is moderately-high - a moderate proportion of land is in crops and the livestock density is low
Stability of Farm Population - Community	-2.6	- a moderately-high percentage of operators are under 55 years of age, but there are very few full-time operators
Stability of Agricultural Land Base - Community	-3.4	- a moderate proportion of land is farmed, owned and in large parcels - the proportion of farm residences is low - the capability ratings are moderately-high; a high proportion of land is in private ownership

TABLE 6-10 cont'd

FACTOR SUITABILITY LEVELS

LF-1E

FACTOR	SUITABILITY LEVEL	RATIONALE
Disruption to the Farm Economy - Region	-1.5	- gross farm revenue is low, as are stack emission indices for livestock; indices for fugitive emissions and downstream livestock are relatively low
Disruption to Farm Traffic Along Access Roads	- 0	- there are no customer/service vehicle stops along regional or local roads - the agricultural vehicle impact index is very low along both regional and local roads
Disruption to Crop and Livestock Production Along Access Roads	-0.1	- a very low amount of land is in crops and very little livestock - no downstream livestock are affected

TABLE 6-10 cont'd

FACTOR SUITABILITY LEVELS

LF-1E/PI-27E

FACTOR	SUITABILITY LEVEL	RATIONALE
Displacement of Farms with On-Site Headquarters	-2.9	- there are many (5) operations with headquarters, all of which are owner-operated, but of very small average size - the estimated gross farm revenue is low
Loss of Farmland	-1.7	- the Class 1 equivalents rating is low; no tile drainage on-site
Partial Displacement of Farms in Vicinity	-3.6	- there are few small farm headquarters in the vicinity losing on-site land, but the proportion of those owned farms losing land is moderately-high
Disruption of Adjacent Farm Operations	-2.8	- a moderate number of farms with head-quarters and a moderate amount of owner-operated land - livestock density is also moderate
Disruption of Non-Adjacent Vicinity Operations	-2.4	- a moderately-large number of farms with headquarters; the proportion of land in crops and the livestock density are both low
Stability of Farm Population - Community	-2.6	- a moderate percentage of operators are under 55 years of age, but there are few full-time operators
Stability of Agricultural Land Base - Community	-2.8	- a low proportion of large land parcels; a low proportion of owned land and area farmed in the community - a very low proportion of residences are farm residences and a low number of Class 1 equivalents - the amount of private land ownership is high

TABLE 6-10 cont'd

FACTOR SUITABILITY LEVELS

LF-1E/PI-27E

FACTOR	SUITABILITY LEVEL	RATIONALE
Disruption to the Farm Economy - Region	-1.3	- gross farm revenue is low - fugitive and stack emissions indices for livestock are both low - fugitive emission indices for crops are moderately-low and stack emission index for crops is moderate
Disruption to Farm Traffic Along Access Roads	0	- negligible disruption along either of regional or local roads
Disruption to Crop and Livestock Production Along Access Roads	-0.1	- a moderately-low rating for adjacent crops with a negligible impact on adjacent or downstream livestock

TABLE 6-10 cont'd

FACTOR SUITABILITY LEVELS

LF-9C

FACTOR	SUITABILITY LEVEL	RATIONALE
Displacement of Farms With On-Site Headquarters	-2.6	- only two operations with headquarters on-site, both owner-operated - farm size and estimated gross farm revenue are moderate relative to other siting options
Loss of Farmland	-2.3	- the Class 1 land equivalent rating is low; this is one of two sites with tile drainage on-site
Partial Displacement of Farms in Vicinity	-2.3	- the number and size of partially displaced farms is small; the proportion of owned land base lost is of moderate consequence, and there is no rented land lost
Disruption of Adjacent Farm Operations	-4.6	- the number of farms with headquarters and the livestock density are both rated high - a moderately-high number of operators with owned land
Disruption of Non-Adjacent Vicinity Operations	-5.0	- livestock densities are very high - number of farms with headquarters is moderately-high, while the proportion of non-adjacent vicinity in crops is high
Stability of Farm Population - Community	-5.0	- the percent of operators under 55 years of age is high - the proportion of full-time operators is moderately-high
Stability of Agricultural Land Base - Community	-5.0	- most of the land is owner-operated, farmed, and in large parcels - farm residences dominate the total number of residences and a moderate amount of land is of Class 1 equivalent

TABLE 6-10 cont'd

FACTOR SUITABILITY LEVELS

LF-9C

FACTOR	SUITABILITY LEVEL	RATIONALE
Disruption to the Farm Economy - Region	-4.9	- gross farm revenue is a moderate amount - relative exposure of livestock to fugitive emissions is high whereas for crops, it is moderately-low - relative exposure of livestock to stack emissions is moderately-low, but for crops it is moderately-high - there is a moderately-high amount of downstream livestock
Disruption to Farm Traffic Along Access Roads	-1.5	- local road impacts are negligible, but along regional roads, the agricultural vehicle impact index is moderate, and the number of customer/service vehicle stops is moderately-low
Disruption to Crop and Livestock Production Along Access Roads	-2.6	- adjacent crops and downstream livestock rate moderately-high - adjacent livestock rates moderate - there is a moderate livestock population

TABLE 6-10 cont'd

FACTOR SUITABILITY LEVELS

LF-3C

FACTOR	SUITABILITY LEVEL	RATIONALE
Displacement of Farms with On-Site Headquarters	-4.9	- two owned farms with headquarters on-site, both are owner-operated - estimated gross farm revenue is high
Loss of Farmland	-3.8	- this is one of two sites with tile drainage on-site - a moderately-low Class 1 equivalent rating
Partial Displacement of Farms in Vicinity	-5.0	- the number of farms with headquarters and their average parcel size are a moderate amount - the proportion of owned land base lost is moderate, but rented land base lost is high
Disruption of Adjacent Farm Operations	-3.7	- a moderately-high number of farms with headquarters, with a high amount of owner-operated land - livestock density is moderately-low
Disruption of Non-Adjacent Vicinity Operations	-4.6	- a moderately-high number of farms with headquarters, and a high livestock density - proportion of land in crops is moderately-high
Stability of Farm Population - Community	-4.6	- a high proportion of operators are under age 55 - a moderately-high number of operators are full-time

TABLE 6-10 cont'd

FACTOR SUITABILITY LEVELS

LF-3C

FACTOR	SUITABILITY LEVEL	RATIONALE
Stability of Agricultural Land Base - Community	-4.4	- a high amount of owner-operated land, large parcels and farmed land - a moderate proportion of the total number of residences are farm residences, and the Class 1 equivalent rating is moderately-high - the amount of private land ownership is high
Disruption to the Farm Economy - Region	-4.5	- gross farm revenue is moderately-low - relative exposure of crops and livestock to fugitive and stack emissions is moderately-low - amount of downstream livestock is high
Disruption to Farm Traffic Along Access Roads	-5.0	- a moderately-high agricultural vehicle impact index rating - a high number of cattle crossings occur along local roads
Disruption to Crop and Livestock Access Roads	-5.0	- the amount of adjacent crops, livestock and downstream livestock all rate high

TABLE 6-10 cont'd

FACTOR SUITABILITY LEVELS

LF-4N/PI-1N

FACTOR	SUITABILITY LEVEL	RATIONALE
Displacement of Farms With On-Site Headquarters	-2.3	- there are moderately-few number of operations with headquarters; two are owned and one is leased - the average size of these businesses is moderately-low - estimated gross farm revenue is moderate
Loss of Farmland	-5.0	- the Class 1 equivalent rating on-site is high and there is no tile drainage
Partial Displacement of Farms in Vicinity	-4.4	- the number of farms with headquarters losing on-site land is high, with average parcel size lost being moderately-high - no on-site owned land is lost by these farms; a moderate amount of rented land is lost
Disruption of Adjacent Farm Operations	-3.4	- a moderately-high number of headquartered farms and operators with owned land are in the vicinity - livestock density is moderately-low
Disruption of Non-Adjacent Vicinity Operations	-3.2	- the number of farm operations with headquarters and the livestock density are moderate - proportion of non-adjacent vicinity in crops is moderately-high
Stability of Farm Population - Community	-4.4	- there is a moderately-high proportion of farmers under the age of 55, as well as proportion of full-time operators

TABLE 6-10 cont'd

FACTOR SUITABILITY LEVELS

LF-4N/PI-1N

FACTOR	SUITABILITY LEVEL	RATIONALE
Stability of Agricultural Land Base - Community	-4.1	- the percent of land in large parcels is high, owned farmland is moderate and area farmed is moderately high - Class 1 equivalents are rated high; farm residences as a proportion of total residences is moderate - the amount of private land ownership is high
Disruption to the Farm Economy - Region	-3.5	- gross farm revenue is moderately-low - fugitive and stack exposure to livestock indices are high; crop indices for fugitive and stack emissions are moderate and moderately-low, respectively
Disruption to Farm Traffic Along Access Roads	-3.0	- the agricultural vehicle impact index is moderately-high and moderately-low along local and regional roads respectively - number of customer stops are moderate along all roads - there are a low number of cattle crossings occurring on local roads
Disruption to Crop and Livestock Production Along Access Roads	-1.4	- adjacent crops receive a moderately-high rating, whereas adjacent and downstream livestock are moderately-low

TABLE 6-10 cont'd

FACTOR SUITABILITY LEVELS

LF-4N/PI-13N

FACTOR	SUITABILITY LEVEL	RATIONALE
Displacement of Farms With On-Site Headquarters	-5.0	- there are a moderately-low number of headquartered farms, half are owned and half rented - the rented farm size is high, as is the estimated gross farm revenue
Loss of Farmland	-4.9	- the Class 1 equivalent rating is high there is no tile drainage
Partial Displacement of Farms in Vicinity	-3.0	- there is a low number of off-site farms with headquarters losing on-site land, but the average parcel size lost is high - there is no owned land lost by off-site farms
Disruption of Adjacent Farm Operations	-5.0	- the number of farms with headquarters is high, as is the number of operators with owned land - livestock density is moderate
Disruption of Non-Adjacent Vicinity Operations	-3.3	- the number of farms with headquarters is moderate - the proportion of non-adjacent vicinity area in crops is moderately-high, and the livestock density is moderately-low
Stability of Farm Population - Community	-4.0	- a moderate proportion of farmers under the age of 55, with a moderately-high proportion of full-time operators
Stability of Agricultural Land Base - Community	-3.7	- a high amount of land in large parcels, and a moderately-low amount of area owned - proportion of farm residences are moderately-low, - the Class 1 equivalent rating is high - the amount of land in private ownership is the lowest of all the siting options

TABLE 6-10 cont'd

FACTOR SUITABILITY LEVELS

LF-4N/PI-13N

FACTOR	SUITABILITY LEVEL	RATIONALE
Disruption to the Farm Economy - Region	-5.0	- gross farm revenue in the region is high - fugitive emissions indices for crops and stack indices for livestock are high - fugitive emission indices for livestock and stack emission indices for crops are moderate
Disruption to Farm Traffic Along Access Roads	-4.3	- the vehicle impact index and number of customer/service vehicle stops are high on local roads and moderate on regional roads - there are cattle crossings on the local roads
Disruption to Crop and Livestock Production Along Access Roads	-1.7	- there is a high amount of land in crops - adjacent and downstream livestock are moderate and moderately-low respectively

An initial ranking of the factors was established by the agricultural consultant. These were circulated to participants at the July, 1985 O.W.M.C. workshops and were discussed at the workshops. The initial factor ranking and rationale are listed in Table 6-11. As a result of feedback obtained at the workshop, several of the factor rankings were changed. The new rankings also appear in Table 6-11.

The thrust of the feedback at the workshops was a desire to assign more weight (importance) to the impacts on vicinity and community/regional factors and less on the factors for which compensation is available i.e. the site factors and partial displacement of farms. This view was considered compatible with that of the agricultural consultant and, therefore, served as the basis for revising the rankings. The statements of rationale have been revised to reflect the reasoning behind the revised factor weights.

The loss of on-site farm businesses was given a moderate weight because it represents a one time impact for which compensation is available through a process established in law, i.e. expropriation. Loss of farmland was given a moderate weighting because the prime farmland resource is in relatively short supply and there is a provincial policy which discourages its use for non-agricultural purposes; however, the loss in absolute terms (hectares) is quite small when viewed in both a regional and provincial context.

Disruption of existing farm operations adjacent to the site was ranked high because these businesses will have to live with the effects of the facilities indefinitely. Because of their slightly greater separation from the site, the disruption to non-adjacent vicinity farm operations was assigned the next highest rank.

TABLE 6-11

RATIONALE FOR RANKING OF FACTORS

FACTOR	INITIAL RANKING	REVISED RANKING	RATIONALE
Displacement of Farms With On-Site Headquarters	4	3	potentially serious and long-term impacts on individuals but largely compensable
Loss of Farmland On-Site	4	3	permanent loss of agricultural resource to society, but land loss in absolute terms is small
Partial Displacement of Farms - Vicinity	5	4	potential for direct, long-term impacts, some of which may be unanticipated but which are partially compensable
Disruption of Adjacent Farm Operations - Vicinity	5	5	potentially serious long-term impacts resulting from noise, traffic, and property value decline, not all of which will be fully mitigated
Disruption of Non-Adjacent Farm Operations - Vicinity	4	4	indirect impacts such as property value decline, effects on community character could potentially affect a large area and number of farm operations
Stability of Farm Population - Community	4	5	residents' perceptions of facility could initiate out-migration, thereby introducing land use, social and economic repercussions
Stability of Agricultural Land Base - Community	3	4	potential for impact is less where non-agricultural developments have already intruded into agricultural areas

TABLE 6-11 cont'd

RATIONALE FOR RANKING OF FACTORS

FACTOR	INITIAL RANKING	REVISED RANKING	RATIONALE
Disruption to the Farm Economy - Region	3	4	connection to many other social, land use and economic factors; mitigation potential could lessen impact
Disruption to Farm Traffic and Cattle Crossings Along Access Roads	4	4	potential interference with farm vehicle movements and cattle crossings, especially on local roads; long-term impacts, cattle crossings mitigated
Disruption to Crop and Livestock Production Along Access Roads	2	2	frequency of occurrence low, affected area small; spill could be cleaned up and compensation paid

A high rank was assigned to the stability of farm population factor because of long-term effects both on the people in the local agricultural community and on the potential of the community to maintain a strong agricultural-based economy. Because of the lower potential for impact, but a large number of potentially affected operations, farm businesses in the regional study area received a moderately-high rank.

Assigned a moderately-high rank was disruption to farm businesses along the access roads. While the effects of the truck traffic will also be of indefinite duration, there are also fewer potential sources of impact than on the vicinity farm businesses.

FACTOR SCORING AND AGGREGATION

Following the results of indicator scaling, ranking and aggregation, the factor rankings were combined with indicator scores. To derive factor scores, the sum of the indicator scores was divided by the sum of the indicator rankings and multiplied by the factor weight. Appendix G contains a more complete description of this procedure.

Table 6-12 contains a summary of the factor scores by study area. These are taken from the detailed calculation matrix in Appendix G. Table 6-12 also aggregates the factors on a scaling (0 - 100) basis. This gives a better view of the relative differences between options for each study area.

COMPARISON OF SITING OPTIONS

The comparison of the six siting options was accomplished by analyzing the data presented in Table 6-12 and 6-13 and by the following summary of the overall scores for all factors for each option.

TABLE 6-12

FACTOR AGGREGATION BY STUDY AREA

FACTOR SCORES*

	SITING OPTION					
STUDY AREA	LF-1E	LF-1E/ PI-27E	LF-9C	LF-3C	LF-4N/ PI-1N	LF-4N/ PI-13N
Site	21.8	13.8	14.7	26.2	21.8	29.8
Vicinity	39.6	37.8	52.3	56.7	47.7	50.2
Community	26.7	24.1	45.0	40.8	38.6	34.8
Region	5.9	5.4	19.5	18.1	14.2	20.0
Access Roads	0.4	0.4	11.3	30.0	14.9	20.8

FACTOR SCALING*

Site	73	46	49	88	73	100
Vicinity	70	67	92	100	85	89
Community	59	54	100	91	86	77
Region	30	27	98	91	71	100
Access Roads	1	1	38	100	50	69

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*High factor and scaling scores denote the least favourable siting options.

TABLE 6-13

COMPARISON OF SITING OPTIONS

Siting Option	Factor Number 1	2	3	4	5	6	7	8	9	10	Aggregated Factor Scaling	Overall Option Rank	Rationale for Ranking
	Factor Scores												
LF-1E	11.8	10.1	17.3	10.5	11.7	13.2	13.5	5.9	0.1	0.3	55	2	Much more suitable than LF-4N/PI-1N; slightly less favourable than LF-1E/PI-27E; site vicinity and community/ regional impacts could be moderately low
LF-1E/PI-27E	8.6	5.2	14.2	13.9	9.7	13.0	11.1	5.4	0.1	0.3	48	1	much more suitable than LF-4N/PI-1N and slightly better than LF-1E; PI is situated on designated industrial lands, not on rural land as in LF-1E, thus more desirable than LF-1E
LF-9C	7.7	7.0	9.1	23.2	20.0	25.0	20.0	19.5	6.2	5.2	83	4	Low on-site impacts due to small site size; but high vicinity and community impacts
LF-3C	14.8	11.4	20.0	18.3	18.5	23.1	17.7	18.1	20.0	10.0	100	6	Poorest siting option; high on-site, vicinity, community and access road impacts
LF-4N/PI-1N	6.8	15.0	17.8	17.0	12.8	22.2	16.5	14.2	12.1	2.8	80	3	Slightly better siting option than LF-9C; most impacts are moderate
LF-4N/PI-13N	15.0	14.8	12.0	25.0	13.2	20.0	14.8	20.0	17.3	3.4	91	5	Slightly better siting option than LF-3C due mainly to lower access road impacts

* 1 Displacement of Farms with On-Site Headquarters
2 Loss of Farmland
3 Partial Displacement of Farms (off-site farms with on-site land)
4 Disruption of Adjacent Farm Operations
5 Disruption of Non-Adjacent Vicinity Operations
6 Stability of Farm Population
7 Stability of Land Base
8 Disruption to the Farm Economy
9 Disruption to Farm Traffic & Cattle Crossings
10 Disruption to Crop & Livestock Production (access roads)

Comparison of Siting Options

LF-1E	LF-1E/ PI-27E	LF-9C	LF-3C	LF-4N/ PI-1N	LF-4N/ PI-13N
55	48	83	100	80	91

Values consist of the sum of factor scores for each siting option converted to the 0 - 100 scale (see Appendix G).

The results of siting option evaluation pointed to this following ranking of siting options, from most preferred to least preferred:

- LF-1E/PI-27E
- LF-1E
- LF-4N/PI-1N
- LF-9C
- LF-4N/PI-13N
- LF-3C

Siting option LF-1E/PI-27E was most favoured because it had the lowest site, site vicinity, community, regional and access road impact potential. The industrial designation of Site PI-27E and its close proximity to an existing mix of heavy and light industrial uses strongly influenced the preference for this option. Agriculturally, it is more desirable to place the industrial facilities (incinerator and physical/chemical plant) on an industrial site away from active agriculture.

Option LF-1E was next preferred because of low impact potentials in the site vicinity, community, regional and access road factors. The site would be in a relatively unstable agricultural area where many small scale hobby farms and non-agricultural activities occur.

Siting option LF-9C and LF-4N/PI-1N were closely ranked. Site LF-9C was less preferred because it has higher vicinity, community, and regional impact potentials.

There was a relatively small separation between LF-3C and LF-4N/PI-13N, as well. The contrast between the two was that LF-4N/PI-13N is an option with two sites (larger size) but situated in a less stable agricultural community, whereas LF-3C occupies a smaller area but is, like LF-9C, in the heart of a stable agricultural community. The least preferred of the two was LF-3C.

SENSITIVITY ANALYSIS

Because of the numerous assumptions made in the foregoing analyses and the inherent subjectively in ranking the factors and indicators, it was necessary to test the implications of the assumptions on the final ranking of the siting options.

The procedures for performing the sensitivity analyses were both quantitative and qualitative. The quantitative analysis utilized the scoring and aggregation system described above by injecting a variety of alternate factor rankings and sets of input data. The qualitative analysis involved a reassessment of the numerically-derived ranking of siting options in light of a number of non-quantified considerations.

The range of sensitivity tests undertaken is outlined in Table 6-14.

Original Versus Revised Factor Rankings (Base Case)

As discussed earlier in the chapter, the initial factor rankings established by the agricultural consultant were amended as a result of

TABLE 6-14

SENSITIVITY ANALYSES

1. Original factor rankings versus revised factor rankings.

2. Other factor ranking alternatives.

3. Soil capability classification revisions.

4. Sensitive crop list versus list of all crops.

5. Treatment of lands designated for non-agricultural uses.

6. Future scenarios.

7. Parcel sizes for LF-3C, LF-1E.

8. Rail access alternatives.

9. Partial solidification.

input from the public workshops. Differences in the final scoring of the siting options based on the two sets of factor weights are shown in Table 6-15. This table shows the different scores for each factor and for the siting options as a whole.

The only difference resulting from use of the initial factor rankings is that option LF-9C is slightly more favoured than option LF-4N/PI-1N.

Other Factor Rankings

In addition to the above two sets of factor rankings, two additional sets of rankings were examined. These are listed in Table 6-16. The ranking in Alternate A responds to the public comments but in a more significant way than does the revised (base case) ranking. In this case, it is assumed that compensation mechanisms would virtually eliminate the impacts for on-site farms and off-site farms losing part of their land base. The remaining factor rankings are the same as for the base case.

In Alternate B, the same assumptions and factor rankings apply to the site and vicinity factors as in the case of Alternate A. However, the rankings for the community, region and access road factors are all reduced by one level from the base case. (The base case refers to the "revised factor rank" column in Table 6-15.)

The results of this sensitivity test is shown in Table 6-17. This table shows only the final scores for each of the siting options after the different factor rankings were applied.

The impact of these rankings was to make LF-4N/PI-1N more favourable than LF-9C. The added weight given to vicinity, community and regional factors caused the site in the more stable agricultural areas, LF-9C, to

TABLE 6-15

SENSITIVITY ANALYSIS OF INITIAL AND REVISED FACTOR RANKING

STUDY AREA	FACTOR	Revised Factor Rank	Initial Factor Rank	LF-1E	LF-1E PI-27E	LF-9C	LF-3C	LF-4N PI-1N	LF-4N PI-13N
				FACTOR SCORES					
SITE	Displacement of farms with on-site headquarters	3		11.8	8.6	7.7	14.8	6.8	15.0
			4	15.7	11.5	10.3	19.7	9.1	20.0
		3		10.1	5.2	7.0	11.4	15.0	14.8
			4	13.4	6.9	9.3	15.2	20.0	19.8
VICINITY	Partial displacement of farms	4		17.3	14.2	9.1	20.0	17.8	12.0
			5	21.6	17.8	11.3	25.0	22.2	15.0
	Disruption of adjacent farms	5		10.5	13.9	23.2	18.3	17.0	25.0
			5	10.5	13.9	23.2	18.3	17.0	25.0
	Disruption of non-adjacent farms	5		11.7	9.7	20.0	18.5	12.8	13.2
			5	11.7	9.7	20.0	18.5	12.8	13.2
COMMUNITY	Stability of farm population	5		13.2	13.0	25.0	23.1	22.2	20.0
			4	10.5	10.4	20.0	18.5	17.7	16.0
	Stability of agricultural land base	4		13.5	11.1	20.0	17.7	16.5	14.8
			4	10.1	8.3	15.0	13.3	12.3	11.1
REGION	Disruption to farm economy	4		5.9	5.4	19.5	18.1	14.2	20.0
			3	4.4	4.0	14.6	13.5	10.6	15.0
ACCESS ROADS	Disruption to farm traffic and cattle crossings	4		0.1	0.1	6.2	20.0	12.1	17.3
			4	0.1	0.1	6.2	20.0	12.1	17.3
	Disruption to crop and livestock production	2		0.3	0.3	5.2	10.0	2.8	3.4
			2	0.3	0.3	5.2	10.0	2.8	3.4
	FACTOR SCALING			55/57*	48/48	83/79	100/100	80/80	91/91
	SITING OPTION RANK			2/2	1/1	4/3	6/6	3/4	5/5

* Factor scaling is 55 for Revised Factor Rank and 57 for Initial Factor Rank

TABLE 6-16

ALTERNATE FACTOR RANKING

FACTOR	ALTERNATE A	ALTERNATE B
Displacement of farms with on-site headquarters	1	1
Loss of farmland	2	2
Partial displacement of farms	1	1
Disruption of adjacent farms	5	5
Disruption of non-adjacent farms	4	4
Stability of farm population	5	4
Stability of agricultural land base	4	3
Disruption to farm economy	4	3
Disruption to farm traffic and cattle crossings	4	3
Disruption to crop and livestock production (access roads)	2	1

TABLE 6-17

SUMMARY RESULTS OF SENSITIVITY ANALYSIS

		SITING OPTIONS					
		LF-1E	LF-1E			LF-4N	LF-4N
		LF-1E	PI-27E	LF-9C	LF-3C	PI-1N	PI-13N
Base Case	- Scaling	55	48	83	100	80	91
	- Rank	2	1	4	6	3	5
Original Factor	- Scaling	57	48	79	100	80	91
Ranking	- Rank	2	1	3	6	4	5
Alternate Factor	- Scaling	49	44	90	100	80	92
Ranking, A	- Rank	2	1	4	6	3	5
Alternate Factor	- Scaling	52	47	92	100	82	94
Ranking, B	- Rank	2	1	4	6	3	5
Revised Soil	- Scaling	54	47	83	100	80	91
Capability	- Rank	2	1	4	6	3	5
List of All Crops	- Scaling	55	48	83	100	80	91
	- Rank	2	1	4	6	3	5
Existing Conditions	- Scaling	54	63	84	100	79	91
(1984)	- Rank	1	2	4	6	3	5
Alternate Parcels	- Scaling	57	49	85	100	83	93
LF-3C	- Rank	2	1	4	6	3	5
Alternate Parcels	- Scaling	51	48	83	100	80	90
LF-1E	- Rank	2	1	4	6	3	5

become less favourable than LF-4N/PI-1N which is in a less stable agricultural area.

Soil Capability Classification Revision

Revised soil capability ratings for sites LF-3C, LF-9C, LF-1E and PI-27E were developed in Appendix C based on the revised soil capability ratings of the O.I.P. (1985). These ratings were used to compute new Class 1 equivalent values for each sites which, in turn, were entered into a test run.

The results of that test run are shown in Table 6-17. No change in the relative ranking of siting option results and there are only very minor changes to the scaled values.

Sensitive Crop List

The assessment of crops that are potentially sensitive to airborne emissions was conducted with full recognition that the information base in the scientific literature is limited. The limitations arise from limited testing of numerous crops and the assessment of a limited range of chemicals on many crops. The question that arises is what change in ranking of siting options would occur if more crops were added to the list of potentially sensitive crops.

The test run, therefore, included all crops inventoried in the study areas during the Phase 4A data collection. The results are shown in Table 6-17. The full crop list made no difference in the relative ranking of siting options.

Treatment of Lands Designated for Non-Agricultural Uses

The assumption was made in the base case analysis that agricultural uses would be deleted from the data base on any lands designated for future industrial, commercial, or residential uses. To test the effect of the assumption on the results of the siting option ranking, the analysis was repeated with all of the existing (1984) agricultural land uses included in the data matrix. Factor weights were the same as the base case.

The results of this assessment are also shown in Table 6-17. The main effect of this test was to cause LF-1E to score lower than LF-1E/PI-27E and thus appear favoured. This result was to be expected because of the assumption and treatment of agricultural data for Site PI-27E.

Future Scenarios

Trends in land use, social character and agricultural activity were examined by L.K.A (1985) and I.E.R. (1985), and the agricultural consultant as they might affect conditions by the year 2000. The trends were examined for the geographic clusters of sites in Milton, West Lincoln and Niagara Falls.

In the Milton case, population growth is expected to occur primarily within the urban boundaries of Oakville and Milton and to a very limited extent in hamlets situated between the two. While few new rural severances are expected, there are numerous existing lots, especially around PI-1N and LF-4N on which houses could be built. At PI-13N, the future use of the Ontario Land Corporation (O.L.C.) lands remains in question. The O.L.C. is attempting to sell these lands but at prices well above their value for agriculture.

It is expected that agricultural activity will continue in the area, largely as cash crop enterprises on rented land, as at present. It is not expected that new farmers will attempt to purchase land for farming. Consequently, there will be little incentive to invest in land improvements needed to maintain soil productivity. It is also anticipated that the land will remain under-utilized because of small parcels and short-term leases. Overall crop productivity of the area will remain below its potential as is the case at present (van Vuuren, 1983).

One exception to this trend will likely be the area of specialty crop production along Trafalgar Road. It is expected that the number of pick-your-own operations will increase as the urban population moves closer, and that the area of ornamental horticultural crops will increase.

The West Lincoln sites by contrast are expected to remain solidly rural in character with agricultural productivity increasing. Very little rural non-farm development is anticipated except on some of the small lots that have not yet been built upon.

There is evidence that new, young farmers are moving into the area. Farm consolidation has been occurring as well as older farmers leaving agriculture. Productivity levels have generally been increasing. More significant increases in yields could be achieved if better drainage outlets were available and tile drainage installed.

At the Niagara Falls sites, it is expected that industrial development will gradually proceed in the area of PI-27E but not at a rapid pace. Small lots in the vicinity of PI-27E and LF-1E will likely be utilized for residential and hobby farming purposes. Because of the high degree of land fragmentation and unfavourable soils, it is expected that there will be little if any significant increase in agricultural utilization and productivity of the landscape around these sites. The large number of

existing non-agricultural uses will continue as potential conflicts to agricultural uses.

In light of above scenarios, there is no reason to believe that the relative ranking of sites should be altered. The West Lincoln sites will, if anything, become slightly less suitable and the Niagara Falls sites more suitable, while the Milton sites remain intermediate. However, LF-4N/PI-13N will continue to be slightly less suitable than LF-9C, largely because of the significance of the specialty crop activity along Trafalgar Road which is expected to expand.

Parcel Sizes for LF-3C, LF-1E

During the detailed comparative evaluation work, a question arose concerning the minimum site size required for sites LF-3C and LF-1E. The question was directed to the sensitive analysis to determine if the alternate sizes would affect the relative rankings of siting options. In the case of LF-3C, the acquisition area was confined to the area west of Krick Road for LF-1E, parcels in the southeast half of the Phase 3B acquisition area were excluded.

The results of these tests are shown in Table 6-17. None of the different site sizes significantly affected the relative ranking.

Rail Access Alternatives

The analysis documented in Chapter 4 on rail access was considered as a potential means of mitigating impacts due to to truck traffic. Because of the very short haul routes between the sites and the QEW highway and the close proximity of rail access and negligible impacts associated with rail access to the sites, rail access will only marginally reduce the transportation impacts. However, it would favour LF-1E integrated more

than the LF-1E/PI-27E combination and thus make the two sites virtually equal from an agricultural viewpoint.

For the LF-3C siting option, rail access is also readily available and involves few impacts. Because of the significant access road impacts associated with LF-3C, rail access would serve as a significant mitigation measure.

In the case of LF-9C, rail access to the site is more difficult and involves more impacts. The degree to which rail access could reduce access road impacts is unclear at the present time and requires further analysis.

For LF-4N/PI-1N, rail access to PI-1N is very easily achieved and involves very little agricultural impact. In this case, use of rail for additives and reagents would be desirable. however, access to PI-13N is very difficult and involves considerable agricultural impacts along the alignment.

The net effect of introducing rail access as part of the facilities at PI-27E, LF-1E, LF-3C and PI-1N would be to bring siting options PI-27E and LF-1E closer together and the same for LF-3C and LF-4N/PI-13N. In the case of LF-9C and LF-4N/PI-1N, it would increase the separation in ranking of these two options.

Overall, the introduction of rail access to sites which would individually benefit, does not affect the relative ranking of sites. This conclusion applies even to the LF-1E, LF-1E/PI-27E comparison where the advantages of having the industrial PI facilities in an industrial zone, are considered to offset the influence of rail access.

Partial Solidification

The analysis of alternate siting options has been carried out under the assumption of total solidification and disposal of the treated waste in the landfill. One alternative to this process considered was on-site evaporation of water and thus a reduction in the volume of material land filled. This process requires a second stack and a stream plume.

From an agricultural viewpoint, use of this process would not affect the ranking of siting options. The steam plume is unlikely to be sufficiently voluminous (see O.R.F. report, 1985 for details) to affect crop production. The annual reduction in quantity of material going to the landfill may reduce the site size requirements and will reduce the number of inter-site truck movements for partially-integrated sites but these will not affect the relative ranking of the sites.

Conclusions

Numerous sensitivity analyses were performed to test a variety of assumptions that were made in the base case detailed comparative evaluation of siting options. Only the "initial factor ranking" and the "existing conditions (1984)" sensitivity tests altered the ranking of siting options from the base case. The former test caused LF-4N/PI-1N to be slightly less favourable than LF-9C while the latter made LF-1E/PI-27E less favourable than LF-1E.

Considering that the reason for amending the initial factor rankings was input from the public, it was deemed appropriate to rely on the base case results. Because of the clear preference in the "Foodland Guidelines" for siting such facilities on land already designated for non-agricultural uses, it was concluded that the existing condition assumptions (1984) should not be used.

CHAPTER 7

CONCLUSIONS

An extensive analysis of the agricultural implications associated with each of the six siting options was carried out. The results of this analysis fed into the overall evaluation work of the site selection team. Input was provided to the refinement of site boundaries, identification of preferred access roads, choice of the preferred location of the physical/chemical treatment plant for each siting option, and identification of potential rail access to each site.

The results of the agricultural evaluation led to the conclusion that the two most preferred siting options are LF-1E/PI-27E and LF-1E integrated. Mainly because PI-27E is situated on industrially designated land and is adjacent to a mix of heavy and light industry, LF-1E/PI-27E is the most preferred option in terms of agriculture.

The least preferred siting options are LF-3C and LF-4N/PI-13N. Site LF-3C is situated in a more stable agricultural community and has numerous potential impacts associated with it, especially on the long access route to the site.

While siting option LF-4N/PI-13N is situated in a less stable agricultural area, its potential impacts are significant because it involves two sites and, therefore, two local agricultural communities. As well, PI-13N is situated just west of a significant specialty crop production area along Trafalgar Road.

Options LF-9C and LF-4N/PI-1N are intermediately ranked between the above extremes but are closer to the LF-3C and LF-4N/PI-13N options than the LF-1E/PI-27E and LF-1E options. These two sites are very closely ranked. LF-9C is considered less desirable than LF-4N/PI-1N because it, like LF-3C, is situated in a more stable agricultural community. Siting option LF-4N/PI-1N is situated in a much less stable agricultural community but consists of two separate sites, whereas LF-9C is the smallest of all of the alternate sites.

The comparative evaluation of siting options was based on an assessment of relative differences in impact potentials for a range of factors. The objective was always to prefer the siting option for which the impact potential would be the lowest. No attempt was made at comparing sites on the basis of absolute impacts.

The decision having been taken by O.W.M.C. to select a site, the remaining task in Phase 4A was to identify the types of residual impacts that would require further investigation in Phase 4B. Numerous mitigation measures have been incorporated into the general facilities design (and thus expressed in the facilities characteristics assumptions) and a variety of site-specific modifications were assessed as a means of ameliorating impacts. These and other measures such as providing for safe cattle crossings were incorporated into the ranking of factors and indicators in the comparative analysis. The same was true for certain basic compensation mechanisms such as the expropriation procedure.

Notwithstanding, the extensive data collection and analysis efforts in Phase 4A, there remain a number of areas in which further information will assist in the filing of a complete impact assessment.

During Phase 4B, the agricultural data base will be verified and further refined. A more detailed analyses will be undertaken to assess

the potential effects of the facilities and their operations on farms in the vicinity and along the access roads. These investigations can provide baseline data for a monitoring program and may assist in the development of compensation policies.

One specific concern raised during Phases 3B and 4A that will be addressed in Phase 4B is perceived risk to crops and livestock. Even though the O.W.M.C. facilities are expected to pose a very low risk given their proposed design and operating systems, the public have expressed concern that commodity groups and consumers might resist the purchase of agricultural produce from the area. As part of the response to this concern, discussions will be held with relevant commodity groups and producers to address this issue.